AN HISTORICAL STUDY OF THE TECHNICAL, LEGAL, AND FINANCIAL DEVELOPMENT OF TELEVISION

A Dissertation

Presented to

the Faculty of the College of Education

The University of Houston

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Education

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by

John Carl Schwarzwalder

August 1953

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Television is the newest of the mass media and one of the most powerful of them. Its history falls logically into four separate divisions.

First to be considered in this study is the technical and scientific history of the medium. This subject tends to sub-divide into two headings. First is the discovery of the scientific laws and principles of magnetism, electricity, optics, and physics. Second is the technical or engineering side of this development which puts these principles to work in a form which can be used by the general public. A differentiation between audio and video development is also made in this section, since audio (or radio) history has already been carefully studied. Especial attention is paid to the international character of the development pattern.

Any scientific discovery with widespread practical application tends to form the foundation for an industry. This is true of television. From the groping inchoate financial instruments used by the early inventors, to the highly complex corporate structure now dominating the industry is a long step, both historically and in terms of legality. The legal struggles between the corporate structures of the American Telephone and Telegraph Company and the Radio Corporation of America and the present division of responsibilities between these two corporations are carefully noted. Also described is the present financial and legal status of the industry.

Television has gained a tremendous hold on the imagination of the American people. With this hold has come a responsibility for programming

standards. The industry is trying to meet these standards by self-regulation of programming abuses. Educational institutions are attempting to raise these standards by entering the field themselves. Citizen's groups and critics are also concerned with standards and are energetically calling their wishes to the attention of the industry.

There are numerous new developments in the television field. Among them are developments such as a greater number of scanning lines in which European companies appear to be leading their American counterparts. Another recent and fascinating development is three dimensional television. A third is color television in which American inventors lead the world. Application of the scientific principles involved in television in order to gain either a larger or a more lucrative audience is another recent development. In connection with this matter, theater television, stratovision, and industrial television are also making considerable progress. Summarizing, it appears that scientific progress in television will continue to produce a better and better picture that the legal and financial difficulties which plagued the start of the industry are, in the main, resolved but that the question of programming in accordance with the best moral and ethical standards is still to be resolved.

CHAPTER I

THE PROBLEM AND DEFINITIONS OF TERMS USED

While television has a long and involved history, it did not become a potent social force until the years following the Second World War. As a result, very little attention has been paid to its historical development. Such historical studies as have appeared have been chiefly in the form of magazine and newspaper articles and in isolated chapters of books which were chiefly concerned with aspects of television other than historical.

I. THE PROBLEM

Statement of the problem. It is the purpose of this study (1) to give an accurate account of the historical development of television in its technical, legal, and financial aspects; (2) to collate the numerous but scattered sources of information on the above; and (3) to prepare a foundation which others might use for further work as the history of television develops.

Importance of the study. Television has already become one of the most important of the mass media. It is now in a period of growth and expansion which authorities like Wayne Coy predict will place it within the homes of no less than 80% of our people by next year.[1]

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1 Wayne, Coy, Address before the Advertising Club of Baltimore, Maryland, March 23, 1949.

It may well be that these authorities err on the side of caution. If, as appears likely, television is to become almost ubiquitous it is perhaps time that its historical development should be traced and the trends in this development exposed. In this study, such an attempt is made.

II. DEFINITIONS OF TERMS USED

Audio. The aural or sound transmission part of broadcasting.

Contrast range. The range between different shades of black, grey, and white on the grey scale.

Definition. A function of the number of scanning lines (in the American system this number is 525) which respond to electronic bombardment.

Halation. A reflection of light within the picture tube.

Multipath reflections. The receiving of not quite simultaneous signals, giving the effect known as ghosts. These "ghosts" are exact parallels of a "sound echo" in aural transmission.

Radio. Exclusively aural broadcasting.

Scanning lines. Lines on the face of the camera and on the picture tube in the receiver which respond to electronic stimuli by producing various shades of grey.

Television. A combination of audio and video broadcasting.

Video. Broadcasting of visual images.

III. ORGANIZATION OF THE REMAINDER OF THE THESIS

The historical development of the technical aspect of television. Chapter II makes a broad inquiry into the discoveries and inventions

which made television technically possible. These discoveries and inventions include both the broad scientific principles involved and their technical application.

The legal and financial aspects of television history. Chapter III is concerned with the development of television from a field where scientists worked sporadically and freely, into an industry with vast financial structures such as the Radio Corporation of America and the American Telephone and Telegraph Company. These corporate entities have stimulated invention and the dissemination of knowledge of television but have engaged in long and hard fought legal struggles with one another. This chapter traces these developments.

Certain social aspects of television programming. Technical, legal, and financial progress in the field of television have made a profound impression on our society. While Chapter IV does not purport to be a history of television programming, it does examine the impact of television on morals, education, and ethics, as reflected in the industry's latest attempt at self-regulation.

Recent developments in television. Chapter V is principally concerned with the most recent developments in television. Included are brief discussions of the present status of European television, theater television, subscription television, stratovision, color television, three dimensional television, and industrial television.

Summary and trends. Chapter VI summarized the information given in the preceeding chapters and notes the present trends in the development of television.

CHAPTER II

THE HISTORICAL DEVELOPMENT OF THE TECHNICAL ASPECTS OF TELEVISION

In 1892 Max Plessner, a journalist, wrote a story about what he called the telectroscope and in this story, he predicted that the telectroscope would present "the stage, opera, important events, sessions of parliament, lectures with demonstrations, church services, and perhaps, the head of the State addressing the whole nation".[1] According to Hubbell, the only thing he has omitted was that television would become a new art form in due time. Obviously, Mr. Plessner's remarks have all come true and many things have been added to television programming which Mr. Plessner did not think of. The very name, television, was first coined around the year 1900. Previous to that date, the phenomenon known now by the name of television had been called telescopy, electrical telescopy, and, of course, the telectroscope. The word, television, was originally French and its roots come from the Greek and Latin words meaning "far and seeing". Numerous definitions of television have been attempted, both popular and scientific. One of the popular definitions is "free movies in your radio set".[2] Another popular definition is "a visual telephone".[3] A scientific definition of television might well be:

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[1] Richard W. Hubbell, Television Programming and Production (New York: Murray Hill Books, 1950), p. 22.

[2] Ibid., p. 11.

[3] Loc. cit.

> An electronic method of transmitting visual and aural images over a considerable distance, reproducing these visual and aural images in an unlimited number of places, and oing this so rapidly that for all practical purposes the transmission is instantaneous.[4]

To go even further, Moseley and Chapple suggest that the oral end of television should be placed outside this definition since that which distinguishes radio from television is that to radio transmission, television adds the conversion of light waves into electronic impulses at the sending end, and the reconversion of electronic impulses into light waves at the receiving end.[5] Others have pointed out that the whole of radio is concerned essentially with the matter of turning sound waves into audio frequency current, thence, the audio frequency current into electronic impulses or radio frequency, and the reconversion of radio frequency into sound waves.[6] The parallel, of course, is exact and precise.

A psychological definition of television is that it is an extension of seeing and hearing over great distances.[7] Hubbell intimates that through the two senses of seeing and hearing, we acquire approximately 98% of all our knowledge and Hubbell further suggests that television is the only invention of modern times which fills a basic human desire never fulfilled before, the desire in question being to be in two places at one time.

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4 Ibid., p. 12.

5 Moseley and Chapple, Television Today and Tomorrow (Isaac Pitman and Sons, 1930) p. 46.

6 Ernest LaPrade, Broadcasing Music, (Rinehart & Co., 1947), pp. 13-17.

7 Hubbell, op. cit., p. 13.

Sociologically, television might be defined as our most potent medium of education and propaganda, and Gilbert Seldes has called it "the instantaneous and complete transmission of actuality".[8] David Sarnoff refers to television's ultimate contribution as "its service toward unification of the life of the individual".[9]

In terms of programming, it is well to recall that the Russian motion picture director, Lev Kuleshow, propounded the theory in 1923 upon which most schools of film production have been based. He stated that in every art there is a raw material and a method of composing that material which is best suited to its essential nature. Various theoretical interpretations of these principles have been made and it is still a considerable question as to whether or not these principles, which have influenced film makers all over the world, are those best adapted to television. In other words, the actual art of television production and television programming is still to be developed and it is necessary, as with any other new art, to study carefully the techniques of programming and production in order to make a contribution to the medium's development.

At this point, it is necessary to point out some of the limitations of the medium as LaPrade has pointed them out in terms of radio.[10]

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[8] Ibid., p. 13.

[9] Ibid., p. 14.

[10] Ernest LaPrade, Broadcasting Music (Rinehart & Co., 1947), pp. 13-17, 22.

LaPrade says, "Radio's reproduction of sound is entirely monaural",[11] by which he means that all sound, transmitted over radio, is heard as though the listener had but one functioning ear. Various experiments in terms of binaural transmission of sound have been successfully made, but the cost of such transmission has been prohibitive up to this point.[12] Again in a parallel matter, it should be noted that television is a monocular system of light wave reproduction, that is, that it appears to the viewer as though he were viewing it through one eye, and that it lacks the three dimensional perception of the human visual system.[13] It is true that these deficiencies, both in radio and television, can be partially overcome by skillful use of microphones and cameras, and present experiments in terms of three dimensional pictures incline us to the belief that eventually we may find a binaural, binocular system of television. This, however, would appear to be some distance in the future. Another handicap which television has in comparison with normal sight is that it is monochromatic, which is to say that while the human eye sees color, the television camera sees only varying shades of grey between black and white. Again, it is becoming increasingly apparent that in the immediate future, color television will be available.

From the above, it is clear that television as compared to the human eye and ear, has the following disadvantages: (1) It is monaural

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[11] Ibid., p. 22.

[12] LaPrade, op. cit., p. 213.

[13] Hubbell, op. cit., p. 18.

and monocular, (2) in terms of sound, neither its dynamic nor its frequency range is as great as that of the human ear, and (3) at present, it does not perceive color. Yet, with these disadvantages, it should be noted that improvements are arriving very rapidly in this field and that in the future it is entirely possible that in all of these areas, television may become as effective as the human system and possibly more effective.[14]

As to quality of picture which has a tremendous amount of influence on programming, there are numerous determinants, and in an introduction of this kind, they must be mentioned. One of these determinants is definition, and definition depends partly on the number of scanning lines, partly on the number of frames, and partly on the distance of the viewer from the screen. The questions of flicker and size of the picture are also important, as is the matter of distortion caused by curvature of the picture tube. Obviously, lighting in the studio and lighting around the television set in the home have a great deal to do with picture quality. There are numerous other determinants of picture quality having to do with halation, contrast range, and electrical interference from other sources, and since these are also highly important to programming, a definition of some of these terms is also essential at this time.

I. TECHNICAL ASPECTS OF TELEVISION

The technical problems involved in television have been defined rather simply by pointing out that the chief problem is the conversion of

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[14] Ibid., p. 19.

light waves into an electrical impulse. We shall deal with the history of this matter within this section. It is notable that for some thousands of years, the effect of light on various materials has been noted by men of all times and cultures. The effects of light on plant life, on minerals, on various substances of a chromatic nature have been known since antiquity. Some of these changes are chemical, as when strong light strikes a painting and eventually fades the coloring. Some of them are physical.

The phenomenon of phosphorescence, for example, has been noted since the earliest days of recorded history. Phosphorous itself, when exposed to light, tends to retain that light briefly even after the source of light has been removed, and doctors in primitive tribes, priests in the ancient religions of Egypt and Babylonia, and numerous scientists have made use of this "phosphorescent" quality of certain other materials.[15] Television also depends very largely on the ability of certain materials to retain light for a brief instant and television would have been impossible had not such substances been found. Among the earliest substances used for actual telecasting is the element, selenium. The early television experimenters constructed a grid containing very small portions of selenium, insulated one from another, and arranged in the fashion of a mosaic. The problem then was to put light on this material at varying intensities; thus, when a particularly bright spot or light hit a dot of selenium, the selenium glowed brightly whereas, a less intense spot of

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[15] Richard W. Hubbell, Four Thousand Years of Television (New York: Murray Hill Books, 1942), p. 34.

light hitting the same material caused it to glow less brightly. The contrast between varying shades of light, of course, makes up a visual image and it is to this matter that we owe development of television. Methods of focusing light on the mosaic material have varied greatly down through television history. Among them have been scanning discs, crude mechanical devices, the use of lenses of varying intensity, and the present cathode ray method. The present electronic system is considered superior to all earlier methods, chiefly, in that it can reproduce light waves of varying intensity much more quickly and cheaply than any of the old mechanical methods.

Summing up all of this preliminary material, it may be stated that the central problem of this dissertation is the collation of available historical material about the technical, legal, and programming aspects of television and the presentation of this material in a form which would be comprehensible to educators and others, who are not specialists in this particular field.

II. DISCOVERIES AND INVENTIONS

It should be noted in the very beginning of a history of television that this art depends upon the knowledge of many different subjects. Among these subjects are optics, magnetism, electronics, astronomy, metallurgy, and chemistry. To achieve television, it was necessary to perfect a machine which could duplicate the powers of the eye and the ear. In addition to this duplication, the machine must be able to

traverse great distances in a split second.[16]

A very brief paragraph is necessary here regarding the actual method by which the human eye works. This may be briefly explained by pointing out that rays of light shine on the object to be seen and from this object, the light is then reflected into the viewer's eye. This image of reflected light or "picture" goes into the eye through the pupil. The iris of the eye regulates the size of the pupil and hence, the amount of light which actually gets into the eye. Next, the image passes through the lens of the eye which is a section of elastic transparent material. The lens then focuses the image on the retina of the eye much as a movie projector focuses a picture on the wall of a room. The retina is composed of the ends of many thousands of small nerves of a special type. When light falls upon these small nerve ends, they are stimulated and in each of them a small electric current is created.[17] These nerves run out of the back of the retina and come together in the optic nerve. Through this optic nerve, small electrical currents flow to the brain which translates them into the sensation which we call sight or vision.[18]

Though we are concerned principally with the sight aspect of television, it would also be well to give some consideration to the functioning of the ear. Briefly, the ear works as follows:

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[16] Ibid., p. 5.

[17] Ibid., p. 6.

[18] Ibid., p. 9.

> The vibration of solid objects in the air transfers those vibrations to the air in sound waves. These sound waves are caught by the outer ears which direct them to the auditory canal. Across the end of the auditory canal is the ear drum which vibrates in sympathy with the sound waves. This, in turn, causes a series of three small bones to vibrate in the middle ear which causes a second ear drum to vibrate. This second ear drum is stretched across the entrance to the inner ear. The inner ear is irregular in shape with a complicated series of canals filled with liquid. Sticking into this liquid from the walls of the canals are thousands of minute nerve endings. When the inner ear drum vibrates, it transmits these vibrations to the fluid in the semicircular canals. The nerves are affected by the vibrations and small electrical currents are created in each nerve. These nerve currents are electrical records of sound vibrations and they pass through the auditory nerves to the brain. The brain, in its turn, translates these currents into the sensation which we call hearing.[19]

Early in recorded history, we find that primitive man learned some things about light, including the fact that light could be reflected from a shining surface or refracted by passing it through water or quartz. Also, as early as 2000 B. C., the ancient Assyrians were using lenses of rock crystal as a method of starting fires.[20] The Greeks and Romans also used a knowledge of optics in several ways. Aristophanes speaks of a burning glass which melted away the writing on a wax table. Around 50 A. D., Cleomedes, in his cyclical theory of meteors, gives examples of the refractions of light, and it is also noted that Ptolmey of Alexandria in the Second Century A. D. and Hero of Alexandria also experimented in optics.[21]

The Greeks also were interested in magnetism and indeed the very

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[19] Ernest LaPrade, Broadcasting Music (New York: Rinehart, 1946), pp. 12-13.

[20] Hubbell, op. cit., p. 18.

[21] Ibid., p. 19.

word magnetism comes from the Greek district of Magnesia. Near the Aegean Sea, iron ore, which behaves like present magnets, was found in great quantities in this district, and while the Greeks used this principally as a matter of magic, it is probably true that this start really gave us our first knowledge of magnetism. However, the total knowledge of magnetism, up until about 1600 A. D., may be summarized in about three parts:

> First, it was known that magnetite would attract certain metals, notably, iron; second, it was noted that a piece of iron when touched by a magnet, becomes temporarily magnetized and is capable of attracting other pieces of iron; and, third, the principle of the mariner's compass was also learned.[22]

It is, of course, possible that the Chinese also knew these principles at a much earlier date. Hubbell credits them with this knowledge at around 1100 B. C. The third main foundation of television was the matter of electronics, and here again, we find that the Greeks were first. Amber was noted to have the peculiar property of static electricity when it is rubbed, but once again, the Greeks used this discovery principally for magic.

The next name in our history of television is that of an Arabian scientist by the name of Abu Ali Al-Hasan. Al-Hasan is important in that before his time most scientists believed that eye could see because it sent out invisible rays like a search light. It was Al-Hasan who said that vision was made possible by rays coming from the object from which one looked and entering the eye. He also wrote considerably about magnifying lenses. The knowledge and books of the Arabs were transferred to

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[22] Ibid., p. 21.

Europe after the crusades and among the Europeans interested in these subjects were the Polish scientist, Vitello (Circa 1270 A. D.), and the English philosopher, Roger Bacon, 1219-1294. Both of these men wrote treatises on optics, but publication of these works and widespread dissemination of the information had to wait until around 1400 when Gutenberg's invention of movable type became generally known.[23]

In 1472, Leonardo da Vinci discovered what today is called the persistence of vision. It is notable that the Roman, Titus Lucretius Caurus, had noted the same think as far back as 65 B. C. and published his knowledge in De Rerun Natura. However, Da Vinci, like practically all of his contemporaries, was not aware of Caurus' work.[24] Persistence of vision, of course, is a physiological phenomenon without which it would be impossible to have achieved either television or the motion picture. A brief explanation of it may be couched in these terms. When the eye receives an image, this image tends to persist for a brief moment after the sight has actually vanished or changed. In effect, the retina remembers an image for a split second after the image has disappeared. For this reason, if an object is moved rapidly, the eye may see it in two places at the same time. There are numerous obvious examples of this; the spokes of a wheel cannot be seen when the wheel rotates and a striped top becomes a solid color as it spins. In motion pictures, of course, what appears to be motion is actually a series of definitely static

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[23] Ibid., p. 22.

[24] Ibid., pp. 23-24.

pictures moved in front of the eye at the rate of 24 per second. In each picture, the action is a little advanced and because the eye remembers the preceding picture, it creates the illusion of actual motion. At the rate of less than 16 pictures per second, one finds a flicker in the picture and much below 14 frames per second, the illusion of motion is lost. Television uses this illusion in the same way to achieve the illusion of motion as is used in the movies. Somewhere around 1670, Sir Isaac Newton used persistence of vision to prove that white light is made up of a blend of all colored lights in the spectrum.[25]

In 1600 A. D., William Gilbert of England published a book with a very interesting title, "De Magnete, magneticisque corporibus, et de magno magnete telluro". Gilbert's book actually was the starting point of a number of interesting discoveries. Gilbert's great contribution to science was his discovery that the earth itself is a great magnet and that it is for this reason that the needle of a compass points north to the North Pole of this magnet.

The next development which was necessary to achieve television was some sort of systematic study of phosphorescence. Phosphorescene had been noted by Pliny and Albertus Magnus and one Vincienzo das Cariolo. Phosphorescents were made by many crude methods such as boiling oyster shells and sulphur. It was not, however, until 1886 that a Frenchman named Sido prepared the first efficient phosphorescent substance.[26]

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[25] Ibid., p. 35.

[26] Ibid., p. 39.

Meantime, numerous other discoveries had been made. The first air pump with which to make a vacuum was invented in 1650, and in 1663 the first machine to generate static electricity was created.[27] In 1676, Roemer discovered that light travels at a definite fixed speed and shortly thereafter, the Dutchman, Huygens, formulated the theory that light is a form of wave motion.

The invention of the Leyden Jar, able to store up electricity, dates from 1745, and shortly thereafter, William Watson was able to send an electrical charge through a wire two miles long.[28] And, of course, in 1752, Benjamin Franklin proved that lightning and electricity are essentially similar. In 1791, one Luigi Galvani published a treatise on animal electricity and discovery of the place that electricity has in the running of the human body is one of the foundation stones of modern scientific knowledge.[29] Subsequently, Alessandro Volta found that when two different kinds of metal are joined in a circuit, a small current of electricity begins to flow from one to the other. Volta also invented the voltaic pile, which, of course, is the forerunner of the modern electric storage battery.[30] Early in the Seventeenth Century, the carbon arc light began to come into prominence and it is notable that both light from the sun and light from the carbon arc lamp made crude photographs

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[27] Ibid., p. 39.

[28] Ibid., p. 42.

[29] Ibid., p. 44.

[30] Ibid., p. 45.

as early as 1802.

In 1816, the Swede, Berzelius, isolated a new element, selenium. The peculiar property of selenium is that it tends to retain light and is an excellent phosphorescent. Shortly thereafter, the first electromagnet was invented and then, in 1831, Michael Farraday of England started a number of his famous experiments on electromagnets.

One of Farraday's principal discoveries is that current in one wire will induce a current in the second wire though the two wires may not be physically connected. Summing up his contribution, we find (1) an electrical current moving in one wire will magnetize a piece of iron next to it, forming an electromagnet; (2) the magnetic field built up by a current flowing in one wire will generate a current in a wire close to it. This is known as induction; and (3) if a wire breaks through the line of force of a magnet, a current is generated in that wire. These discoveries were basic to the development of the microphone, the television camera, and the transmitter. Rapid progress took place in practically all scientific endeavors during the Nineteenth Century. By 1836, the telegraph was coming into use.[31] In 1839, no less than three photographic methods were worked out. In the same year, Bacquerel made an observation on the electro chemical effect of light which was essential to the discovery of photo electric calls. In 1842, Alexander Bain had a method of facsimile for sending still pictures. In 1846, Royal House patented the first teletype system, and in 1848 Becquerel did the pioneer work on color photography. The first actual transmission of a picture

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[31] Ibid., p. 59.

came in the early part of 1862 when Caselle sent a drawing through a wire from Amiens to Paris, and in 1866 a transatlantic cable was completed. All of these discoveries pointed the way to the important work published in 1873 by James Clerk Maxwell.

Maxwell's work was important in that it systematized the knowledge of electricity discovered up to that point, but most important in that he declared that light is a form of electromagnet wave. It was about fifteen years later before physical proof of this was given by Henrich Hertz. Another event of 1873 of tremendous connotations was that a cable operator named May noted that selenium discovered by Berzelius in 1816 offered less resistence to an electric current when exposed to light than when in the dark. In other words, selenium was photo-electric. May recognized the possibilities that this had and tried to build a machine to transmit pictures. It did not work, but only two years later, in 1875, the first television set was built.[32] In that year, an American, G. R. Carey of Boston, designed the first television system. He tried to duplicate the human retina and electrically constitute a Mosaic of selenium cells. Each selenium cell was connected by a separate wire to an electric light. The design of light focused on the mosaic caused some of them to react and pass an electric current. The cells which reacted sent currents through their wires to their own electric lights. The lights were activated and reproduced the shape of the original design. Hubbell points out that only a rough outline with very little detail can be sent by such a

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[32] Ibid., p. 58.

method and that a detail picture would require at least 250,000 cells, wires and lamps. Nevertheless, Carey's idea while not a complete answer to television, is still used in electric signs.

In 1880, the French scientist, Maurice Le Blanc, seeing the difficulties which Carey had encountered, invented a method of scanning. His idea was that instead of attempting to transmit an entire picture, the picture should be broken up into tiny spots of varying shades of light and dark. Then these tiny spots would be transmitted one by one in definite precise order. As they arrived at their destination, they were to be reassembled in the same order. This discovery is still basic to modern television.

Henrich Hertz, meantime, in 1885, proved that Maxwell was right in declaring that light was an electromagnetic wave and in discovering this, he discovered how to make radio waves and send them through space, and also proved that radio waves are electromagnetic. Next, he discovered what is called the photo-electric effect; i.e., the effect of light on electricity. He found out that the light from burning magnesium would actually knock a stream of electrical energy from one wire to another. From this, he found that radio waves could be refracted just as light could be refracted. Also, in 1884, Dr. Paul Nipkow, a German, invented the Nipkow disk. The Nipkow disk was a revolving metal disk perforated with a series of holes.[33] While it has been superseded since the early 1930's, it was a step forward in that the Nipkow revolving disk

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[33] News item in the New York Times, August 25, 1940.

was able to separate the picture into smaller fragments than the Mosaic pattern method used up to that time. However, the lack of a reliable method to amplify the power of the tiny electric currents created by selenium limited severely the development of his method until about 1906.

As the Nineteenth Century was coming to a close, Carl Braun actually made the first television tube by coating the inside of a tube with a fluorescent substance. Thus, when the light passed through Nipkow's revolving disk, it hit the fluorescent substance on the inside of the tube and lighted it up. This, of course, had to be perfected, but it actually was the first modern television tube.

The term, television, has numerous claimants for its coinage. A Frenchman named Perskyi claims that he coined it in early 1900.[34] Hugo Gernsback claims that he first used the work in 1909.[35] In 1905, Albert Einstein announced the theory of the photo-electric effect and defined the way in which the camera would turn a picture into electricity and in 1904, the first real radio tube was produced by an Englishman named J. Ambrose Fleming. Actually, Fleming's work had gone as far back as 1890, but 1906 was the date when an American, Lee De Forrest, invented the three element radio tube.

The next vital contribution to television came in 1907 when the Russian, Boris Rosing, patented a television system using a receiver

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[34] Annexes Congres Internationale d'Electricite, (Paris, 1904), p. 39.

[35] Modern Electric Magazine, December, 1909, p. 30.

which is scientifically the same as the modern receiving set and was based on Braun's cathode ray tube. One of Rosing's students was a young man named Vladimir Zworykin, who many years later perfected the first television camera based on the cathode ray tube. It is interesting to note that while most people think television is completely new, that by 1908 most of the principles on which television is based were already known. An Englishman named A. A. Campbell Swinton had actually suggested the use of two cathode ray tubes, one in the transmitter and one in the receiver, and he had described this in considerable detail by 1911.[36]

In the meantime, Lee De Forrest's tube, of course, had been put to work as an amplifier and strengthener of radio signals, and he actually broadcast signals by radio, and actual sound, as early as 1910.[37] And in 1912, it was discovered that De Forrest's tube could be made to amplify an electrical impulse more than 100,000,000 times. This supplied the power which had previously been lacking to make Braun's and Nipkow's devices actually produce television. In August of 1920, the magazine, "The Wireless Age", announced that one H. Grinnell Mathews of England had actually made a television set. In 1923, Charles Francis Jenkins of Washington, D. C. using a Nipkow disk, sent a photo of President Harding a distance of 130 miles from Washington to Philadelphia and in 1925, Captain Richard Ranger sent maps and photographs of war games

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[36] Nature Magazine, London, December, 1911, p. 15.

[37] News item from the New York Times, January 9, 1910, Section A, p. 10; News item from the New York Evening Sun, January 14, 1910, p. 14.

from New York to Honolulu, or more than 5,000 miles. Also, in 1925, John Baird in London was sending moving silhouette pictures. The following report is given by The London Times on January 27, 1926: "Members of the Royal Institute and other visitors to a laboratory in Soho . . . saw a demonstration of an apparatus invented by Mr. J. L. Baird. On a receiver in the same room as the transmitter and, on a portable receiver in another room, visitors were shown recognizable reception of the movements of the person speaking. The image as transmitted was faint and often blurred, but substantiates the claim that through the 'televisor', as Mr. Baird has named his apparatus, one can actually discern the details of movement."

In the February 5th issue of the English magazine, "Nature", Alexander Russel wrote, "Mr. Baird has now developed a method by which the image of a person may be transmitted although he is in complete darkness. This result is obtained by flooding the sending room with infra-red rays. Mr. Baird called this the noctovisor."

In 1927, engineers of the American Telephone and Telegraph Company televised from New York to Washington and back. They used the Nipkow method and the picture had 50 line definition. By 1929, the Nipkow disks were producing pictures with 90 lines and by 1930, they had pictures up to 240 lines by the Nipkow method. This apparently was about as high a line definition as the Nipkow disk was able to produce, and definition in these pictures was still blurred and flickery. In 1928, on February 8, Baird in England sent the first television picture from England to America. On February 11, the New York Times stated, "Baird was the

first to achieve television at all over any distance . . . his success deserves to rank with Marconi's . . ." In June of 1928, Baird took the first outdoor television pictures and on August 22nd of that year, the General Electric Company did a remote "television pick-up" from Albany, New York, where Alfred E. Smith accepted the Democratic nomination for President.[38] At the same time, Baird demonstrated color television and three-dimensional television in London.

In October of 1928, Philo T. Farnsworth brought out a type of cathode ray camera which is different from that developed by Zworykin. Much litigation was to follow, but it appears at this point in history that Farnsworth's method ante-dates that of Zworykin. In November of that year, Zworykin demonstrated his cathode ray receiving set and also the kinescope.

Further inventions came very quickly. In 1930, General Electric sent a television signal to Australia and back again and accomplished this within one-eighth of a second, and in March of 1930, Baird and the B. B. C. in London began actual television broadcasts. In April, the Bell Laboratories demonstrated a television-telephone booth. People seated in telephone booths miles apart could see and hear each other simultaneously. Also, in April, screen television began to be seen, and in May, a 7' x 6' screen was put up by General Electric in Schenectady, New York.[39]

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[38] Hubbell, op. cit., p. 91.

[39] Orrin Dunlap, "The Outlook for Television", Harper's Magazine, June, 1932, p. 34.

By 1931, at least fifteen companies had television broadcasting schedules in the United States alone and regular programming had begun to take place.[40] However, on February 25, 1933, the Columbia Broadcasting System announced the suspension of television broadcasts until better equipment was available. The station had been on the air more than 2500 hours, but CBS had decided that the camera with the mechanical revolving disk could not produce a satisfactory image. Television appeared at this time to be doomed as far as becoming an actual industry was concerned.

The savior of television here was Vladimir Zworykin, who invented the new iconoscope camera. Zworykin had started work on it in 1923 and had a patent granted in 1928. His work, which was paid for by R. C. A., cost the company more than four and one-half million dollars. His discovery followed the theoretical work of Campbell-Swinton in 1907 and 1908 described above, but it took David Sarnoff, the head of R. C. A., and his ability to see the importance of the invention, before sufficient money was made available to perfect the idea.

Both the iconoscope and Philo Farnsworth's dissector camera are still used. Neither of them has any disk of the Nipkow type. Both are capable, both of rapid dissection of an image and of instant and tremendous amplification of electrical currents caused by light.

As we have noted in the eye, the picture is focused on the sight nerves of the retina. Actually, there are about 137,000,000 of these

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[40] Ibid., p. 38.

including the "cones" which see colors. This was what man had to duplicate if television was to be achieved, but if it takes 200,000 separate impulses to represent one complete picture, it was obvious that no mechanical means could achieve this vast number. Furthermore, in order to get a reasonably good quality picture, it is necessary to transmit about 6,000,000 impulses per second. A revolving metal disk or drum cannot revolve fast enough for that because machinery cannot stand such speed.[41] Hence, the importance of the work of Zworykin and Farnsworth in the 1930's.

A brief explanation of the principles of Zworykin's work follows. The light waves of the picture pass through the lens of the camera and focus the image on the retina of the iconoscope. The retina of the iconoscope is called the Mosaic which is made up of a sheet of mica, the surface of which is studded with hundreds of thousands of globules, each one separate and insulated from all the others. These metal specks are sensitive to light and generate an electrical charge within themselves whenever light shines on them. (Selenium, which we have mentioned before, is no longer used since its reaction was too sluggish.)

The stronger the light wave, the stronger the electrical current generated. Although there are many hundreds of thousands of globules, the charges are eventually grouped together in about two-hundred thousand little dots. Thus, the optical picture creates an electric replica of itself in an equivalent of some two-hundred thousand separate electrical charges. The electrical record of the picture is thus stored in the

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[41] Hubbell, op. cit., p. 111.

Mosaic. The metal specks of the Mosaic being insulated from each other retain their own charge of electricity. In order to send this electricity through long distances, it is necessary to have what Hubbell calls an electron gun. This electron gun shoots a stream of electrons at the Mosaic in a scanning fashion. Actually, it sprays the electron stream across the first line of the Mosaic, then across the second, etc. At the same time, it also sprays up and down, from right to left, in what is called interlaced scanning. As the electron stream hits each globule of the Mosaic, it, in effect, drives the electrical charge which has been stored there through the mica into a metal plate on the other side. The metal plate is connected to a wire. As each small electrical charge is knocked through the mica to the plate, it flows away through the wire. This, of course, happens 200,000 times per second and the electric impulses, all now in regular order, move in single file through those wires.[42] In order to maintain the illusion of motion, this has to happen thirty times per second. Therefore, we must multiply our electric impulses of 200,000 by 30, which totals 6,000,000 impulses per second. These impulses or currents are strengthened in amplifiers and send to the transmitter which eventually pumps them out in electromagnetic waves. The electromagnetic waves go out through the air at 186,000 miles per second and these, in turn, "induce" current in antennas attached to television receivers. These impulses are in exactly the same order as when they left the microphone and camera.

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[42] Ibid., p. 115.

What remains, of course, is to reassemble them and turn them back into their original form of light waves. This is done by the television receiving set. A simplified explanation of this is that as the electrical impulses come into the set, they are separated on the front of the camera tube (which is the television screen) which is coated with a fluorescent material which will retain light briefly. Since the bright and dark specks of light constitute the picture and since these are both put on the television receiver tube in exactly the same order as they were put on the retina of the camera, the picture is reproduced exactly as it is seen in the studio.

III. TECHNICAL STANDARDS

The illusion of motion in pictures as we have mentioned before, depends on there being approximately 30 complete pictures every second and, as we have noted, if television is to achieve a reasonable facsimile of a picture which the eye might see, there must be some 200,000 electrical impulses per picture. This again must be multiplied by the factor of 30 to achieve motion, giving a total of approximately 6,000,000 impulses per second. It will be recalled that in 1884 Paul Nipkow patented his whirling scanning disk. The Nipkow disk, however, was limited. A revolving metal disk cannot whirl fast enough to produce anywhere near the necessary 6,000,000 impulses and actually, while Nipkow's disk was historically important in this connection, it actually retarded the progress of television.[43] From 1884 until approximately

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[43] Ibid., p. 281.

1932, technicians and scientists devoted a major part of their energies to this whirling disk, attempting to get greater speeds at a uniform rate. This, by definition, was almost impossible, and at best this whirling disk was never able to produce more than 1,000,000 impulses per second. It took a long time for scientists to realize that the tremendous speeds necessary to produce even a recognizable picture by this method were impossible of achievement, and it was only when the work of Zworykin and Farnsworth began to be perfected that modern television became practical.[44]

In 1933, Zworykin and Philo Farnsworth had begun the perfection of the cathode ray tube camera and sound broadcasting (radio) had begun to achieve some extraordinary results. RCA put Zworykin's iconoscope camera and kinescope receiver into use. The Nipkow system had given a picture of 120 lines of definition. The iconoscope in 1933 gave a picture of 240 lines definition, and the following year, 343 lines definition was achieved. Progress began to be fairly rapid. Oren Dunlap, writing in the New York Times on January 5, 1935, asserted that the prospects for television in 1935 were excellent in a scientific sense, but that economically, it was still not feasible due to the fact that television would render obsolete some 18,000,000 radio sets.

However, in February of 1935, the British Broadcasting Corporation and John Baird announced a public television service for Great Britain

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[44] Hubbell, op. cit., p. 12; Television Programming and Production.

and similar arrangements were being made with Philo Farnsworth by the Fernseh Company of Germany. On May 7, 1935, the Radio Corporation of America announced that it would spend $1,000,000 on experimental television broadcasts. These actually began on June 29, 1936.[45]

As a parenthetical note, on November 6, 1935, Major Edwin Armstrong announced his development of FM or frequency modulation radio, and, it might be noted that the Federal Communications Commission in 1941 found this method of broadcasting so superior to all others that it insisted it be used for all sound television broadcasting.[46] In 1936, the Don Lee Broadcasting System on the West Coast began television demonstrations with cathode ray tube equipment and in the Fall of that year, the A. T. & T. put in a new kind of coaxial cable between New York and Philadelphia.[47] In May of 1937, RCA demonstrated television pictures 8' x 10' in size on a screen and in 1938, the Radio Manufacturers Association proposed that the Federal Communications Commission should establish a set of television engineering standards. Meantime, RCA bought patent rights for television inventions from all sorts of people. Among these were inventions of Harry Lubcke (of the Don Lee System), Allen Dumont and Philo Farnsworth.[48] By October 20, 1938, RCA was radiating its television programs out approximately sixty miles from New

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[45] News item from the New York Times, June 30, 1936.

[46] Hubbell, op. cit., p. 130.

[47] Ibid., p. 133.

[48] Ibid., p. 135.

York from a tower atop the Empire State Building.[49]

The opening of the World's Fair on April 30, 1939 was televised by RCA and achieved a tremendous amount of publicity for that company and for television.

> "Television is...a major technological accomplishment...a giant a-borning. On April 30th, the trumpets will blow and the bands will play and long after the World's Fair becomes one of the grandfather's stories, April 30 will still be the day they formally began television service in the United States."[50]

It was, of course, only some six months later that war broke out in Europe and this had a tremendous hampering effect upon further commercial progress. One result was the November 15, 1939, report of the Federal Communications Commission Television Committee. This report stated that "no one should be permitted to speculate in the use of public property in the radio spectrum".[51]

The Federal Communications Commission then held a public hearing on January 15, 1940, in Washington. The hearing showed a great deal of disagreement among engineers as to the technical standards. It also pointed out that television broadcasting was expensive and that every cent spent was a loss.[52] Even in these later days, the $1,000,000 per year spent by CBS in 1939, and the more than $2,000,000 a year spent by RCA seemed considerable factors. Moreover, the problem of obsolescence

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49 Ibid., p. 135.

50 Fortune Magazine, March 1939.

51 Federal Communications Commission Report of 1939.

52 Hubbell, op. cit., p. 139.

of receivers proved to be a major headache since the old receivers owned by the public would not work on the new system and few persons had great confidence that radical changes would not be necessary in the immediate future. The Commission desired to protect the public against the economic loss which would ensue if constantly changing standards were allowed to render obsolescent a huge quantity of receivers.[53] Finally, the Federal Communications Commission ruled, as a result of these hearings,

> "Research should not halt, and scientific methods should not be frozen in the present state of the art. The need for further improvement in the technical quality of television is realized. Research...should continue. It is not suggested that television broadcasters should be barred from going forward in program production and sponsorship subject to the above conditions...Even more important, however, nothing should be done which will encourage a large public investment in receivers which by reason of technical advance.....may become obsolete in a relatively short time...It will be realized, therefore, that the loss to the public by premature purchasing in a rapidly advancing field might...exceed many times the present cost of research. Such an economic loss, in the long run, can redound only to the harm of the industry...The Commission, therefore, is reserving the matter of issuing standards for consideration at some future time."[54]

One month later, on March 23, 1940, the Federal Communications Commission ordered the television hearing reopened and, as a result, the New York Times, two days later, said "the green light has been switched to red on television broadcasting".[55] The actual words of the Commission were,

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[53] Ibid., p. 140.

[54] Federal Communications Commission Television Report (United States Government Printing Office, Washington, D. C., February, 1940).

[55] New York Times, March 25, 1940.

> "The Federal Communications Commission desires to determine whether research and experimentation and the achievement of higher standards of television transmission are being unduly retarded by RCA ... and whether the beginning of limited commercial operation should be changed from September 1, to some subsequent date. Meanwhile, that section of new rules permitting commercial telecasting is suspended..."[56]

This order caused a tremendous furor in the newspapers and elsewhere. The New York Herald Tribune commented on March 26, 1940 that standards of transmission above 441 lines were apparently wide open and it pointed out that the FCC's ruling was open to the most serious question.[57] On May 28, 1940, the Commission issued yet another report and stated that the television industry, as a whole, did not believe in extending commercialization at this time. It further ruled:

> "In order to assure to the public a television system, standards of transmission should not now be set and there should be no commercial broadcasting until such time as the possibilities of basic research have been fairly explored. As soon as...the industry is prepared to approve any one of the competing systems of broadcasting as a standard system, the Commission will consider the authorization of full commercialization."[58]

During the winter of 1940-1941, the Federal Communications Commission re-studied the latest engineering developments and a voluntary association of all television companies proposed standards for the FCC to approve for adoption for black and white television, the standards being 525 lines of definition and 30 complete pictures per second. These standards were

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[56] Federal Communications Commission Order 239 (United States Government Printing Office, March 23, 1940).

[57] Item from the New York Herald Tribune, March 26, 1940.

[58] Federal Communications Commission Report (United States Government Printing Office, Washington, D. C., May 28, 1940).

officially adopted in the Federal Communications Commission Report dated May 3, 1941, and we have them still.[59] This same report authorized full commercial broadcasting of television beginning July 1, 1941.

It is worth noting that this commercial broadcasting was, to quote Adrian Murphy of Columbia Broadcasting System Television, "entirely academic at this time". To begin with, there were only 5,000 sets in the New York area; secondly, all of these sets had to be remodeled in the following respects: (a) Raising the picture from 441 lines to 525 lines, (b) all sound was being broadcast by FM which necessitated a change in the audio side of all receivers, and (c) the television channels had to be shifted. Doing these various things took approximately three months and cost both set owners and broadcasters considerable sums.[60] For these reasons, when the Columbia Broadcasting System station in New York, WCBW, went on the air, on July 1, it was broadcasting its programs to a largely non-existent public.[61] Nonetheless, the programs went on and were steadily improved during most of that year and even though the coming of war to the United States in late 1941 made materials exceedingly hard to obtain, the broadcasting companies, notably the National Broadcasting Company and the Columbia Broadcasting System, continued to push television to its fullest extent.[62] Indeed, an attempt to link television to the

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[59] Federal Communications Commission Report on Television (United States Government Printing Office, Washington, D. C., May 3, 1941).

[60] Hubbell, op. cit., p. 154.

[61] Loc. cit.

[62] Ibid., p. 156.

national defense in order to assure it priority on materials was seriously made in early 1942 by various people, including Norman D. Waters, President of the American Television Society.[63] The American Television Society worked on plans for educational work on the New York television audience of approximately 50,000 persons, in terms of civil defense,[64] and were able to report:

> "through their own initiative and endeavor, in conjunction with certain other groups...the television broadcasters are well on the way toward easing the priorities pinch by making the medium indispensible to the war effort."[65]

> "Later, it was noted that the key note of television today is the role it is playing in the national defense...in New York City, it is now used as a chief method toward training air raid wardens. New York City police officially have expressed the conviction that without television the task of training the tens of thousands of air raid wardens would be most difficult and expensive."[66]

Moreover, the public was buying television although no effort was made to sell huge amounts of sets and although the public was constantly warned of television's uncertain future. In New York City, sets were selling at the rate of about ninety a month at the beginning of 1942. Ninety a month meant just about the entire available supply in New York.[67] On April 17, 1942, the Defense Communications Board recommended there be no further construction of radio television transmitters or stations and

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[63] Ibid., p. 157.

[64] Ibid., p. 194.

[65] Item from the Radio Daily, January 3, 1942.

[66] Norren E. Kersta, "TV and Defense", Electronics Magazine, March, 1942.

[67] Hubbell, op. cit., p. 198.

this, of course, meant the end of extended network operations for the duration of hostilities. This was not to be changed for another four years. However, even so, it was possible for the Chairman of the Federal Communications Commission, James L. Fly, to state on June 17, 1942, "Judging from the accomplishments of the commercial television industry during the war, you know you have there an industry which is ready to go and will dominate the field after the war".[68]

IV. TECHNICAL DEVELOPMENTS SUBSEQUENT TO 1945

After the Second World War, public hearings were conducted in the winter of 1944-1945 by the Federal Communications Commission. As a result, the FCC allowed the industry to develop twelve channels between 24 and 216 megacycles. Frequencies were so distributed as to avoid interference. Under this plan, some 400 stations could be on the air giving program service to 140 metropolitan areas, acting for about 57,000,000 people or some 40% of the population. It was recognized that many rural areas would be without any service whatever under this plan.

The plan, however, ran into other, unanticipated, trouble. Interference was greater than had been expected and in September of 1948, the FCC reluctantly called a temporary halt to the development of television and imposed a "freeze" on its processing of hundreds of new license

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[68] "Testimony Before the House of Representatives, Interstate and Foreign Commerce Committee by Chairman Fry." (United States Government Printing Office, June 17, 1942).

applications which had been sent in.[69] In 1949, however, there was significant development in network operations. Coaxial cable and micro wave relays connected most larger cities between Boston and Richmond, Virginia, and in January 1949, a coaxial cable connected the East Coast and St. Louis, and a micro wave system connected New York and Chicago.[70]

Meantime, considerable study had been given to the use of UHF or ultra high frequencies in the band from 475 to 890 megacycles which had been set aside fro television by the Federal Communications Commission in 1945, and in 1949, this band of the spectrum was authorized for use by the FCC.

V. PRESENT STATUS OF TELEVISION

As has been noted, television was first authorized on a commercial basis in this country five months before Pearl Harbor. Also, as we have seen, World War II held up television development so that at the end of the war, there were only six television stations on the air. However, by January 1950, there were 98. When the war ended, there were 7,000 receiving sets in the entire country. By April 1950, the number exceeded 4,000,000. In 1947, advertisers looked suspiciously at television, but within a year, the National Broadcasting System, to take one example, had increased its time sales by one thousand percent. Set manufacturers

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69 -------, "The Television Freeze", Fortune Magazine, November 1949.

70 "Address by Wayne Coy, Institute for Education by Radio in Columbus, Ohio, May 5, 1949."

in 1947 numbered only 29; by February 1950, they numbered 109.[71]

The Chairman of the Federal Communications Commission stated that "five years from tonight (1949), I expect to see 600 to 800 stations on the aid. That will mean that five years from now, television service will probably be available to the majority of the people in the United States".[72]

Another quote says that "five years from now, there will be 20,000,000 sets, one for every two households. These sets are being steadily improved and the prices are coming down".[73] Needless to say, these prophecies have been more than fulfilled. Other unprophesied developments in the technical phases of television are being constantly brought forward. Most of the most important of these are dealt with in the last section of this paper.

VI. SUMMARY OF CHAPTER II

The first part of this section was principally concerned with the discoveries and inventions which made television possible. Such names as Aristophanes, Leonardo da Vinci, Roger Bacon, Allessandro Volta, and William Gilbert evidence the international character of the contributions as well as the spread of time required.

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[71] Charles Siepmann, Radio, Television, and Society (Oxford University Press, 1950), p. 317.

[72] "Address by Wayne Coy, Institute for Education by Radio in Columbus, Ohio, May 5, 1949."

[73] "Address Before the Canadian Manufacturers Association by Commander George Sterling, June 8, 1949."

Later it was seen that most of the newer inventions and discoveries came from Western Europe and America, though international cooperation continued in the field. An interesting sidelight in the development of television is that originally, the discoveries were chiefly the result of independent men of science working apart from each other, while the closer we approach to our times, the more important the financial resources of governments and large corporations become.

CHAPTER III

LEGAL AND FINANCIAL ASPECTS OF TELEVISION HISTORY

In this section we shall deal with the legal and financial maneuvers which have resulted in the present situation as regards the control of the television industry.

First to be dealt with is the rise to dominance of the American Telephone and Telegraph Company. Next the challenge to the American Telephone and Telegraph Company by the Radio Corporation of America is discussed. After this the struggle between the Radio Corporation of America and the motion picture industry is noted, and finally the present apparently stable arrangements between these financial powers, together with statistics regarding the ownership and operation of television stations, is presented.

I. LEGAL AND FINANCIAL CONFLICT IN TELEVISION

In beginning this section, it may be well to pay heed to the Report on Technical Trends and National Policies of 1937 which pointed out some of the dangers to the public interest in the development of radio and television. Among other things this report stated:

> When to the spoken work is added the living image, the effect is to magnify the potential dangers of a machine which can subtly instill ideas, strong beliefs, profound disgust and affections.
>
> There is danger of propaganda entering the schools and perhaps even greater danger of propaganda entering the home. How great is the power in the control of mass communication, especially when helped by modest inventions, has been made clear recently in countries that have had social revolutions, and which have promptly,

> in a very short period, brought extraordinary changes in the expressed beliefs and actions of vast populations.
>
> These people have been led to accept whole ideologies contrary to their former beliefs, and to accept as the new gospel what many outsiders would think ridiculous. The most powerful means of communication, especially for rapid action in case of revolution, are the electrical forms like radio and television, which spread the most skillfully presented ideas to every corner of the land with the speed of light and a minimum of propaganda labor. Compared with these, the soap box orator with his audience of a dozen and the local preacher with his two-hundred are at a grave disadvantage. Certainly no advertiser would expect to sell as many goods by an appeal reaching ten dozen as by one reaching ten million.
>
> Television will have the power of mobilizing the best of writers and scene designers, the most winning of actors, the most attractive of actresses.[1]

These views were presented to the President of the United States on June 18, 1937 and among the signatories of the report were men of such diverse political tendencies as Harold Ickes, Daniel Roper, Beardsley Ruml and Henry Wallace. Obviously, even at this early date, many thoughtful men had seen the potentialities, both for good and evil, of this important television medium. Moreover, their remarks about advertising showed that they were aware that the control of television in a financial sense was going to be of the utmost interest to the American people. Television, then as now, was the newest and at the same time the most effective way of communicating information, misinformation, and entertainment.[2] Even in 1938, as we have seen, television was able to put out a

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[1] Report on Technical Trends and National Policies of 1937 (Washington, D. C.: United States Government Printing Office, 1937), p. 3.

[2] Frank C. Waldrop and Joseph Boykin, Television, A Struggle for Power (New York: Wm. Morrow and Company, 1938), p. 7.

fairly clear picture on a 7" x 12" screen and enlargements of this screen for home use were already practical. Already by this date, radio had achieved a mass audience which made it a rival of the newspapers for the advertiser's dollar and for the favor of its audience.[3]

It is well to recall that in 1937, the National Broadcasting Company showed a revenue gain of 18% over 1936 and that 36 new broadcasting stations came into operation in this year. In contrast, the newspaper industry showed a bare 2% gain in that same year. Again in 1937, some of the greatest corporate organizations in the modern world were beginning their legal struggle for the development of television. Among these were the American Telephone and Telegraph Company, the Radio Corporation of America, Westinghouse Electric and Manufacturing Company, the General Electric Company, and the Columbia Broadcasting System. Even at this date, each of the financial giants was searching desperately for inventions and basic patents which they might use to improve their own legal positions.[4]

As has been pointed out before in this thesis, the work of the early experimenter was highly important to both radio and television, and among these early experimenters, the name of Thomas Alva Edison should be recalled. Mr. Edison, of course, was the inventor of the so-called Edison Effect in 1883 and the Edison Effect which we have discussed previously was the basic patent for wireless transmission of electrical

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[3] Loc. cit.

[4] Waldrop and Boykin, op. cit., p. 10.

energy. In 1899, J. J. Thompson explained scientifically what Edison had accomplished and in 1903 J. A. Fleming was able to make what he called a "Thermionic valve" which could regulate electron escape from filament to plate and hence made possible the invention of the cathode ray tube. In 1906, as noted above, Lee DeForest improved this cathode ray tube in a radical manner, and again patents were taken out. DeForest had been prosecuted as a faker and had been threatened with jail for trying to sell stock in his invention before he had proved it.[5] The DeForest tube is still the basic tube for the transmission of electrical energy, both in radio and television.

> The invention of the vacuum tube as a satisfactory amplifying modulating tube opened up the door through which have come in all the things which have created the modern electronic industry, but, likewise, all of the things which have created the problems which confront the Federal Communications Commission and the industry at this time.[6]

It has already been pointed out that the amount of investment and the number of inventors has been great in this field and it is further worth noting that in the early days of scientific development, these inventors borrowed freely from one another's work. One of the reasons certainly, that they did borrow and lend so freely was that at the time, it seemed there was little commercial value in what they were discovering. Thus, when commercial applications were discovered, it was obvious that patents on these inventions were far from clear. Yet the very

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[5] Ibid., p. 14.

[6] Quotation from Frank B. Jewett, Chairman of the Bell Telephone Laboratories in The New York Times, March 28, 1953.

continuation of television and ultimately all television profits depended on a clear patent title for the companies making such profits. The profits, of course, would not go principally to the inventors, but to the stock holders. It is notable that Marconi died and left an estate of less than $150,000 and that Lee DeForest went bankrupt.[7]

Among the early entrants into the electronic field in 1937 were the American Telephone and Telegraph Company and the Radio Corporation of America. In testimony before the Federal Communications Commission in that year, David Sarnoff of the Radio Corporation of America said:

> The problem which will confront the Federal Communications Commission will be in the last analysis a problem of relative merit of modes of transmission.
>
> On one hand for things like the radio that are indicated as the sole or only way of giving service, that prevails; but if it comes to the proposition of the thing in which it is obviously an alternative, the question becomes an economic one, and the question as to whether we should use up a portion of our limited results for a thing for which there is an alternative will have to be determined, as will the question as to whether the differences in cost are such to justify such an expense.[8]

Mr. Sarnoff later said, "From time to time, there are suggestions that it is the duty of the F. C. C. to protect the wire services (telegraph) against the encroachment of radio."[9] He countered these arguments by saying:

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[7] Ibid., p. 29.

[8] Report on the Informal Engineer Conference, Federal Communications Commission, Dockett 3929 (Washington, D. C.: United States Government Printing Office, 1937), Vol. 1, p. 44.

[9] Loc. cit.

> Any effort to stop the progress of a new art in order to protect the existing arts is futile.
>
> Such a step would be contrary to the spirit of the country, contrary to the spirit of progress, and contrary to the whole experience of radio, for radio itself deliverately obsoletes (sic) today what it built yesterday.[10]

The importance of the patent position in radio and television is, of course, enhanced by the fact that the radio spectrum is limited. That inventor who is able to promise a more efficient use of the existing spectrum gives a great additional value to his work.

This problem has been set in its proper legal boundary by Lewis Caldwell, former Chairman of the American Bar Association Committee on Radio Law, in the following words:

> Another message that the facts and principles of radio brings to us is that without the rigid governmental regulations, you are not going to have any radio communication at all. The broad problem of the F.C.C. is to apply the test of public interest, convenience or necessity. In radio, it is going to be frequently necessary to take someone out of business from time to time to make room for someone else.[11]

It is obvious that if somebody is going to be put out of business from time to time to make room for somebody else, as Mr. Caldwell suggested, that the basis for this must be that one company's patents or inventions are so superior to another company's patents, that they can better serve the public interest, convenience and necessity. Hence, the

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[10] Loc. cit.

[11] U.S. Senate Committee of Interstate Commerce, Hearings on S.-6 71st Congress, 1st Session (Washington, D.C.: United States Government Printing Office), p. 86.

terrific struggle for patent control.[12]

There is one institution which has missed no opportunity to prepare for television. This institution is the American Telephone and Telegraph Company, more familiarly known as the Bell System. The Bell System at present has an arrangement with the radio broadcasters to transmit by its telephone lines all network radio programs. In return for this business, American Telephone and Telegraph, which formerly owned and operated radio stations, has given up such ownership and operation.[13]

The chief competitor for first place honors with American Telephone and Telegraph from 1922 to 1937 was the Radio Corporation of America. Mr. David Sarnoff once stated:

> The ideal way of sending messages is to hold up a printed sheet that may be immediately reproduced at the other end. Facsimile and television are ready to do this. If a strong company attempted this, the telephone people might find themselves in a very unenviable position.[14]

This overt threat to American Telephone and Telegraph had been anticipated by Mr. J. E. Otterson who said to the Federal Communications Commission:

> A primary purpose of the American Telephone and Telegraph Company is the defense and maintenance of its position in the telephone field of the United States. The American Telephone and Telegraph Company is surrounded by potentially competitive rivals who may intrude upon the telephone field. Our problem is to prevent this intrustion. It seems to be essential to the accomplishment of this primary purpose that American Telephone and Telegraph shall

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[12] Loc. cit.

[13] Giraud Chester and Garnet Garrison, Radio and Television (New York: Appleton Century Crofts, 1947), p. 22.

[14] News item in the New York Times, December 5, 1934.

maintain an active offensive in the "no-mans" land lying between it and potentially competitive interests.[15]

It is notable that the American Telephone and Telegraph Company had been in patent fights for control of its monopoly long before this. For example, on February 14, 1876, one Elisha Gray filed a patent stating that he had invented a telephone. Mr. Gray's entry was #39 in the patent office that day. He was shocked to learn that entry #5 of the same day was made for a similar patent by one Alexander Graham Bell. American Telephone and Telegraph, which later had to defend the Bell patent, won its case though there was some evidence that perhaps the filing of the patents did not reflect the hour at which they arrived at the patent office.[16]

It may be well at this point to point out a little of the history of American Telephone and Telegraph. On February 27, 1875, the Bell Patent Association was formed in Boston, Massachusetts. In 1876, the four basic patents were obtained. In 1877, Western Union bought Elisha Gray's patent and prepared to fight American Telephone and Telegraph. In 1878, the Bell System received new capital to carry on its legal battle. In 1879, the National Bell Telephone Company was formed and on November 10, 1879, a settlement was made with Western Union.[17] In this agreement,

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[15] J. E. Otterson, "Four Square Memoranda", F.C.C. Special Television Investigation Exhibit 518 (Washington, D.C.: United States Government Printing Office, January 13, 1927), p. 15.

[16] Waldrop and Boykin, op. cit., p. 55.

[17] Report on American Telephone and Telegraph Company Corporate and Financial History, Interstate Commerce Commission (Washington, D.C.: United States Government Printing Office, 1929) Appendix 7, p. 24.

Western Union agreed to stay out of the telephone field and American Telephone and Telegraph agreed to stay out of telegraphy.

It is worth noting that later on, Western Union objected to American Telephone and Telegraph's wire system for teletypewriter's, transmission of news, and other printed data. However, Western Union was powerless to prevent such action by American Telephone and Telegraph. All in all, during the seventeen years of the original patents' existence, the Bell System brought more than six hundred suits against persons infringing on these patents. It was able to settle almost all of them in its own favor.[18] Moreover, it has been said that even "after the Bell System lost patent control, they continued to defend their position by the following means: Active propaganda campaigns against competitors, refusal to sell Bell instruments to non-Bell companies, purchase of key units within attempted combinations, and purchases by dummy masks of controlling interests."[19]

In 1926 the American Telephone and Telegraph Company came into strong competition with another growing industry, the motion picture industry. Western Electric Company, a subsidiary of American Telephone and Telegraph, formed in its turn another subsidiary called Electrical Research Products, Incorporated on December 30, 1926. In February, 1927, when silent motion pictures had become an inescapable reality, it was obvious that American Telephone and Telegraph and the motion picture

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[18] Waldrop and Boykin, op. cit., p. 59.

[19] Ibid., p. 145.

industry were going to have to fight or get together since they were using the same basic patents. After much backing and filling, ninety percent of the industry signed contracts with Western Electric to the effect that they would use Western Electric's equipment exclusively untill 1944 and pay royalties to Western Electric for the use of such equipment. Furthermore, it was pointed out that such equipment was not to be used by the movies in connection with radio and television.[20] This decision was immediately challenged by David Sarnoff and the Radio Corporation and a court fight ensued which was not settled until December 19, 1935.[21] In this court settlement, the Radio Corporation of America was given permission to sell its equipment to the movie companies with use of patents already granted by American Telephone and Telegraph. It has been felt by many that probably Mr. Sarnoff and his company might have been able to take over the movie industry but for the depression which resulted in late 1929 which seriously damaged the corporate finances of the Radio Corporation of America.[22]

A word now might be said about the Radio Corporation of America and its history and early development. It is interesting to note that the original patents of Marconi were filed in Great Britain, but that as we have noted, the inventor profited little by these patents, and that

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[20] Ibid., p. 153.

[21] Federal Communications Committee, Special Television Investigation Exhibit 379 (Washington, D. C.; United States Government Printing Office, 1935).

[22] Waldrop and Boykin, op. cit., p. 160.

it was an American corporation, the General Electric Corporation, which bought out the British and American Marconi Companies. On October 17, 1919, it set up the Radio Corporation of America.[23] At this point, the United States government decided to give its entire electronics business to the Radio Corporation of America, even going so far as to abandon use of the patents owned by the government.[24]

With the expansion of the radio industry, the Radio Corporation of America and its subsidiary, the National Broadcasting Company, became extremely powerful. Even in the depression year of 1936, the Radio Corporation of America's net income was over six million dollars and with its subsidiaries it had spent, in the course of business, over nine million dollars in that year.[25]

In spite of this, no dividend had ever been paid by the Radio Corporation of America until 1937. When the 1937 dividend was paid, stock of the Radio Corporation of America on the New York Stock Exchange rose from a low price of $150.00 per share to $549.00 per share. The profits on this matter can be readily seen.[26]

So far, the growth and the struggles between the Radio Corporation of America and the Bell System have been noted. The Bell System had, of

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[23] News item in The London Times, Index for 1919, p. 314.

[24] Waldrop and Boykin, op. cit., p. 167.

[25] Moody's Manual of Investments (New York: Moody and Company, 1937), pp. 2187-2191.

[26] Lod. vs. R.C.A. 24F (2d) 565, affirmed 28F (2d) 257, Supreme Court, State of New York.

course, one strong advantage in that it controlled the telephone lines of the United States. This had not been too important to the Radio Corporation of America during the days when it was primarily concerned with the sale of equipment. But, when the subsidiary, the National Broadcasting Company, went into network operations, it soon became clear that transmission of radio programming from one city to another by radio means was inferior to transmission by telephone line. American Telephone and Telegraph, wishing to do its competitor all possible damage, refused to lease lines unless they were given a share of the Radio Corporation of America profits. Thus, the grounds for combat were clearly drawn. The arena in which this combat was to be fought out was, of course, the Federal Communications Commission, which had been established by Federal law in 1934. Both the companies in the meantime were being harassed by anti-trust suits from various quarters including inventors, independent companies, independent movie producers, independent newspapers and others.[27]

In addition, new patents concerning television had now come into the picture. On July 22, 1935, the patent office awarded to Philo Farnsworth priority on basic television patents. Vladimir Zworykin was an inventor working for the Radio Corporation of America. Farnsworth, a very young man at that time, was an independent inventor. His inventions for a transmitter tube for television dated from his days as a sixteen year old high school boy at Rigby, Idaho, and these patents, which he

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[27] Waldrop and Boykin, op. cit., pp. 182-190.

obtained on the basis of his work in a high school chemistry class have been held to be superior to those obtained by the Radio Corporation of America. Zworkin, who developed similar patents, was an immigrant from Russia in 1917 and had failed at that time to make any sale of his own patents. In 1923, however, he secured employment with Westinghouse Electric Company and in 1928 eventually joined the Radio Corporation of America. Some of his patents are owned by Westinghouse and some by the Radio Corporation of America. Westinghouse and the Radio Corporation of America filed suits, one against the other, to control Zworkin's patents and an agreement was eventually reached, leaving the Radio Corporation with controll of the field.[28]

The Radio Corporation of America and the National Broadcasting Company did not return to their privileged position in broadcasting for a particularly long period of time. They found strong competition from the Columbia Broadcasting System, from other networks, and from a large number of independent radio and television operators. It is worth noting, however, that the Radio Corporation of America, due to its control of basic patents, still collects a license fee on every radio set manufactured in the United States and it could legally force the stoppage of the entire equipment manufacturing business if it wanted to, simply by refusing to renew licenses as they terminate.[29] It is doubtful that they

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[28] Ibid., p. 209.

[29] Ibid., p. 221.

would ever do so because of public reaction. The Radio Corporation has eventually settled with the Farnsworth inventions, with the American Telephone and Telegraph, and with its competition in the radio industry. Its present position in this respect is that it controls basic patents and is still on the alert to control still other basic patents as they are approved. It has a strong position in radio and television broadcasting through its National Broadcasting Company subsidiary, but it has been prevented by the Federal Communications Commission from becoming an absolute monoply. The Bell System has, of course, become a monoply under strong governmental regulation in the field of telephony and wire. It, however, is in no position at present to refuse its services to the Radio Corporation for numerous reasons. Among these reasons are lack of desire to promote public inquiry into its operations, the strong possibility that further anti-trust regulations might be initiated, and finally, and perhaps the most important, the fact that its patent position has been greatly weakened by certain law suits in 1932 and 1933.[30]

One further struggle remained to be adjudicated. This had to do with new methods of transmission of electronic energy. Radio wireless telegraphy from abroad and from point to point in this country became more and more efficient and the discovery of the micro-wave relay system was to have tremendous effect upon television transmission. Roughly speaking, micro-wave transmission involves the beaming of radio signals

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[30] Ibid., p. 228.

from one point to another without the use of wires. At the second point, the signal is received, amplified, and retransmitted to yet another point. Under ordinary circumstances, it may be cheaper to transmit these signals by wire by coaxial cable, but over distances covered by large bodies of water or by rugged or mountainous terrain, the expense of stringing coaxial cable either above or below the surface of the earth may be prohibitive. For this reason, the control of micro-wave transmission was an initial economic factor in the development of nation-wide systems of television. The original agreement between the Radio Corporation and American Telephone and Telegraph left wireless transmission to the Radio Corporation, but when American Telephone and Telegraph found that its entire very profitable wire leasing revenue might be endangered by this new development, it prepared for battle.[31] A complicated court struggle was eventually settled in 1941 by a court decision which ruled that it was legal for the Radio Corporation to lease facilities from American Telephone and Telegraph for micro-wave transmission. In this connection it will be recalled that the American Telephone and Telegraph Company started some network radio broadcasting as far back as January 4, 1923 and broadcast programs simultaneously over New York and Boston stations. Later that same year, another station in Washington, D. C. was linked with the previous two. By the fall of 1924, American Telephone and Telegraph was able to furnish a coast to coast network of 23 stations to carry a speech by President Coolidge, and by

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31 Ibid., pp. 257-263.

1925, its regular networks of 26 stations extended as far west as Kansas City with fairly intense coverage.[32] Meanwhile, the Radio Corporation was making its start in network broadcasting even though American Telephone and Telegraph refused to furnish telephone lines for use by competing networks and would not permit the Radio Corporation to sell broadcast time to advertisers. For obvious reasons, the Radio Corporation of America network did not grow as rapidly as the American Telephone and Telegraph's, and in March, 1925, it consisted of only four stations. This situation changed abruptly in 1926 when under the terms of the agreement already mentioned, American Telephone and Telegraph sold its New York station to the Radio Corporation of America, transferred most of its radio properties to the Radio Corporation, and agreed to make its telephone lines available to the Radio Corporation. The Radio Corporation of America, as we have seen, agreed to stay out of the telephone business. However, it did maintain a dominant position in chain broadcasting until 1943 when, following the Federal Communications Commission's Order on Chain Broadcasting of 1941, it sold its second network, ordinarily called the Blue Network.

II. THE PRESENT SITUATION

By the year, 1952, American Telephone and Telegraph controlled the micro-wave facilities which transmit television programs over approxi-

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[32] Chester and Garrison, op. cit., p. 26.

mately one-half of the area of the United States and these micro-wave facilities are leased by American Telephone and Telegraph to any and all interested broadcasters. It has a standard license fee which gives preference to no broadcasting company. The alternative to such agreements approved by the courts would have been the construction of duplicate facilities and long and involved legal struggles. It was held by the Federal Communications Commission and the Supreme Court of the United States that any such involved struggle would not be in the interest of the entire radio public. It is due, of course, to the strong desire of both companies to avoid such unfavorable public reaction that isolated sections of the country were and are able to view national programs of importance by radio and television from major news centers.[33]

III. PRESENT FINANCIAL POSITION OF TELEVISION

Gross receipts for the nation's television stations in 1952 rose 43% over gross receipts for 1951. Total television broadcast revenues including sales of time, talent and program material to advertisers in 1952 rose to $236,000,000 from $135,000,000 the previous year. Overall earnings before Federal taxes for the television industry were estimated at $54,500,000. Most of this increase in revenue was gained by local stations rather than by the networks.[34] While the networks grossed about

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[33] Waldrop and Boykin, op. cit., pp. 254-269.

[34] FCC Financial Report for 1952 (Washington, D.C.: United States Government Printing Office, 1952), p. 24.

$92,000,000, they had expenditures of about $83,000,000, which left an income before taxes of only about $9,000,000. This was a 22% drop from the $11,000,000 profit for the networks of the previous year. A parenthetical contract shows that radio network profits rose during the year 1952, indicating that television is not appreciably hurting radio receipts. Indeed it is noteworthy that 1952 was the second best year in the entire history of radio.

Ninety-four out of one-hundred and eight television stations operating all through 1952 reported profits and of the fourteen television stations reporting losses, seven had losses of less than $100,000. Nine of the fourteen losing stations were located in New York and Los Angeles.[35]

Summarizing, it should be noted that as a result of the struggles detailed above, the competitive corporate structure of radio and television today is as follows:

American Telephone and Telegraph has almost monopolized the transmission facilities while the Radio Corporation of America and the Columbia Broadcasting System, with their competitors have gained a dominant position in programming. In equipment manufacture and sale tremendous competition prevails which has numerous competitors aside from those discussed above. All of these equipment manufacturers, however, still pay royalties to the Radio Corporation of America for the use of its patents.

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[35] Ibid., p. 37.

IV. PRESENT OWNERSHIP OF TELEVISION STATIONS

One other aspect of this financial struggle is the relationship between the radio and television industries. The great majority of licensees and applicants (76.7%) for television stations were in 1950 associated with AM and FM radio operational stations. Siepmann suggests:

> ...that the investment is a form of insurance for capital already sunk in radio. An FCC breakdown of the business interest of television licensees and applicants follows:

	Number	Per cent
Newspaper publishing	128	31.1
Broadcasting only	66*	16.1
Motion pictures, theaters, et cetera	27	6.6
Radio manufacturing	25	6.1
Merchants, dealers, et cetera	25	6.1
Miscellaneous manufacturing	18	4.4
Real estate, insurance, et cetera	17	4.2
Oil Production	17	4.2
Educational institutions	10	2.4
Miscellaneous	76	18.6
Subtotal	409	100.0
Information not available	26	
Total	435	

> *The apparent disparity between this figure and the 76.7 per cent earlier quoted is explained by the fact that many AM and FM radio stations are themselves owned and operated by newspaper publishers, radio manufacturers, and so on.[36]

As to television finance, television is generally held to be four to five times as expensive as radio.[37] Construction costs for

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[36] Charles Siepmann, Radio, Television, and Society (New York: Oxford Press, 1950), p. 98.

[37] Ibid., p. 102.

stations range from a highly conservative estimate of $300,000, to $1,000,000 and this compares with the average original cost of regional radio stations of $133,000. Average individual operating costs for stations in 1948 amounted to $538,000. Staff requirements range up to a personnel of well over one-hundred and the average is fifty.[38] A one hour dramatic show costs at least $20,000 to produce and the sponsor of the World Series television broadcasts even in 1949 paid $140,000 for the rights alone. Such costs have been met by the advertiser and by the networks. The Columbia Broadcasting System, for instance, claims to have spent $3,500,000 since 1940 on color television alone and in 1948 the industry as a whole suffered a loss of approximately $15,000,000.[39] However, by 1952, 94 of 108 stations were profitable enterprises and the gross profits of the industry amounted to $54,000,000. It is the advertiser who has made this difference. Television had 23,000 advertisers in January 1950, but in September of 1948, there were only 236 advertisers. What the effect of 2,000 new stations, each taking its own cut out of this advertising market will be is still open to question. However, in the opinion of one expert, the advertiser will not be able to support more than 400 stations.[40]

Meantime the freeze on construction of United States television

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[38] Ibid., p. 327.

[39] Loc. cit.

[40] Millard C. Faught, "A Positive Approach to the Future of Television," (Address to the Advertising Club of Washington, D. C., March 17, 1953), p. 4.

stations imposed by the Federal Communications Commission in October, 1948 was in effect throughout 1951. Only 108 stations were operating, 94 of them profitably. UHF transmission was first accomplished by the Radio Corporation of America on their experimental station KC2XAK at Bridgeport, Connecticut which was operated throughout the year on a regular schedule.

V. THE RISE OF NETWORK OPERATIONS IN TELEVISION

Networking in television as in radio has been necessary in order to spread heavy production costs over many stations and to make national audiences available to advertisers. Networking was hindered in this field by the need of special and expensive coaxial cables to link stations together. Four networks, the National Broadcasting Company, the Columbia Broadcasting System, the American Broadcasting Company and the Dumont Broadcasting Company have been developed in television. A fifth network run by Mutual Broadcasting System is planned. Although Dumont had no previous radio network, it was an early entrant into the television field. All networks resorted to kinescoping or film recordings in order to supply programs to their affiliates beyond the reach of existing coaxial cables or in order to avoid cable costs.[41] Chester and Garrison suggest that early indications are that the National Broadcasting Company will eventually dominate the television networks.

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[41] Chester and Garrison, op. cit., p. 43.

VI. SUMMARY

In this section it has been noted that the large corporation has come to dominate the radio-television field. The independent inventor like Elisha Grey or Philo Farnsworth eventually has sold out to one or another of these corporations, since only such large financial accumulations have the power to exploit the inventions. The financial and legal history of television then has become largely a record of struggle between the American Telephone and Telegraph Company, the Radio Corporation of America, Western Union, the motion picture industry and the Columbia Broadcasting System with affiliated firms.

While the situation now is more or less quiescent on all fronts there is little reason to believe that there will not be renewed struggle for control of all facets of this growing industry.

CHAPTER IV

CERTAIN SOCIAL ASPECTS OF TELEVISION PROGRAMMING

This section is concerned principally with the social impact of television programming and its effects on the public. In this connection the industry's attempt at self-regulation as expressed in the Broadcasters Creed of the National Association of Radio & Television Broadcasters is of obvious importance.

Hardly less important, however, are the reports made in various professional journals as to this social impact and its importance to our times.

Finally, since Educational Television may be expected to develop programming different in quality from that presented by commercial interests, it was essential that a brief discussion of this new development should be included in this section.

I. MORAL EFFECTS OF TELEVISION PROGRAMMING

It was noted in Section II that the advertiser has made television a profitable business today as compared with its impecunious status of a few years ago. The moral effects upon programming have been noteworthy. For example, Dallas Smythe states that the Vice President of the J. Walter Thompson Company, a prominent advertising agent, stated that in terms of programming and with specific reference to sex appeal that a good general rule was to try to get away with as much as you can.[1]

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[1] Charles Siepmann, Radio Television & Society, New York Oxford Press, p. 28.

Meantime, Commander Bower, Director of the Dumont Television Network berates the mass audience for its tendency to expect something for nothing in these words,

> A race raised on a diet of entertainment shortly will display many characteristics of a moron, including the demand for more and more of less and less, and lack of appreciation for favors rendered ... we are selling television short and entertainment is allowed to dominate the industry to the exclusion of a sane sales method.[2]

The Federal Communications Commission has spoken of this tendency in the following terms:

> Advertisers and agencies are not licensed by the government as are the stations. Yet ... they exert an enormous influence over the kind of program service that the stations provide. I suggest the public interest will be served ... if the advertising industry recognizes and respects the licensees wishes.[3]

In the meantime, the audience for television has grown and expanded in an unusual pattern. Money has been invested in television by the public even when cash was not available, and deferred payment is a characteristic of television purchasing.[4] In a community near New York, the average family as early as 1948 spent more for television than it spent for such items as movies, jewelry, cosmetics, and all forms of printed matter. By January 1, 1950, the number of sets in this community quadrupled over the number in 1948.[5] Moreover, it appears that television purchases have

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[2] Wayne Coy, "March 5th Address of the Ohio Institute for Education by Radio," Education On The Air, O. Joe Olson, ed. Columbus: Ohio State University, May, 1949, p. 130.

[3] Wayne Coy, Address before the Advertising Club of Baltimore, Maryland, March, 1949.

[4] Siepmann, op. cit., p. 337.

[5] Loc. cit.

been concentrated chiefly in the lower and middle income,[6] and it further appears that the audience for television, unlike that for radio, is chiefly composed of children and men.

Of the social effect of television, much remains to be written, but television definitely appears to have had a tremendous upsetting influence on the pattern of leisure habits. There is a decline in movie going, in attendance at sporting events, in reading and in radio listening,[7] and it is also apparent that television appears to be giving the family a more centered orientation.[8] Television's effect on other media has been an interesting matter. Strangely enough, as has been noted before, radio has been less effected than earlier prophets of doom, including a former president of NBC, had thought, but motion pictures and magazines appear to have been hard hit. An example of this latter factor is the recent decision of Collier's Weekly to publish only twice a month.[9]

II. THE NARTB CODE

Television, which is in the opinion of many educators, potentially the world's most powerful instrument for bringing enlightenment and understanding to all people, has been inundated for many months by criticisms

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[6] Ibid., p. 338.

[7] Ibid., p. 342.

[8] Loc. cit.

[9] Associated Press dispatch, May 10, 1953.

from individuals, organizations, and publications. Out of this flood has come the new television code of the National Association of Radio and Television Broadcasters (NARTB). The code was put into operation on March 1, 1952. The NARTB, a trade association, has succeeded in this manner in putting a type of unofficial censorship over the publicly owned TV channels.[10] Many persons have expressed serious doubts as to the legality of this procedure, but many others, including Judge Justin Miller, have called this Board of Censors "the Supreme Court of Broadcasting".[11] The code itself consists of a preamble, a section on program standards, and a section on regulations and procedures. Subscribing stations include about eighty-five of the nation's one-hundred and eight television stations. Stations subscribing to the code are permitted to display on the air The NARTB Seal of Good Practice, which purportedly guarantees to the public that the station's programming complies with the standards set forth in the code. The purpose of the code is to establish minimum program standards. However, Dr. Dallas W. Smythe of the University of Illinois points out that the code assumes the right of the NARTB as a trade association to make policy in the name of the public and he further suggests that the code indentifies immorality with innovation in the arts. He also suggest it will be stultifying to

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[10] Franke Orme, "Television Code", The Quarterly of Film, Radio and Television, Vol. 6, No. 4, December, 1951, p. 9.

[11] San Francisco Chronicle, February 29, 1952, p. 11.

the development of originality in TV programs.[12] Dr. Smythe states

> one view makes a neo-victorian sense of morality the guide to wholesomeness. For people with this view, it means the absence of certain kinds of vulgarity. Such critics may succeed in imposing on television as they have on motion pictures, a censorship policy which prescribes the height of necklines, but if this view prevails, there is real danger of throwing out the baby with the dirty bath water. Banality and formula entertainers will become even more dominant in television than in motion pictures ... the contrasting interpretation of wholesomeness may apply this term to entertainment which has the following qualities, respect for human beliefs with insight into all the elements of strength and weakness, of humor and grief. At the other end of the school, one might place vulgarity in the sense of degradation, triteness and certain forms of formula drama. It might be argued convincingly, I think, that the dignity of human beings may be degraded more deeply and the family hearth more abused by such things, than by the low cut gown or the joke which offends. Some minority groups believe that wholesomeness is more than the negative notion of sterilizing the comments of comedians and determining the amount of the female body which may be exposed to the hearthside viewer. It is rather a characteristic of the work of the creative artist judged by some such standards, as I have tentatively suggested ... to express itself in large measure in forms which such entertainment might assume have not yet been created by television producers. All the more reason, therefore, not to shackle them so tightly with the twin handcuffs of a censorship code resembling that of motion pictures.[13]

Yet, it is notable that the strength of this public pressure on the television programs has had wide popular support. A survey of crime programs televised in Los Angeles during the first week of May, 1951, revealed the following things: (1) Seventy percent of all television programs televised for children during the week were based on crimes; (2) Eight-hundred major crimes were portrayed for children during this single week; (3) The average child in the television home viewed death by

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[12] Dallas Smythe, "Consumers Stake in Radio and Television," The Quarterly of Film Radio and Television, Vol. 6, No. 1, p. 10.

[13] Ibid., pp. 14-15.

violence more than forty times during the survey week; (4) Horror and violence were the prime ingredients of television's contribution to the children of Los Angeles.[14]

The administrative structure of the NARTB code is as follows: At the top is a board of thirteen censors who are also members of the NARTB Board of Directors. This group is supported by a five member review board without actual administrative power. Thus, it is seen that the censorship jury consists entirely of men who are concerned financially with the programs they will judge. Four members are employees of four major television networks. Six others are managers of TV stations. The code insists that all proceedings will be conducted by the censors in complete secrecy. The five member review board is also composed entirely of NARTB members. Each member of this board is a station manager of a TV station. Each will serve without payment. Three of these members live in cities where the one station in operation is under his personal control. Not one of them lives within viewing distance of a major production center.[15]

The duties assigned to this review board are: (1) They are required to maintain a continuing review of all television programs (this will total 450,000 hours in 65 different cities); (2) The review board must receive, screen and clear all complaints on program content which come to the NARTB. They must define and interpret the code, they must

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[14] TV Magazine, (June, 1951), p. 8.

[15] Orme, op. cit., p. 17.

develop and maintain liason with governmental agencies, and they must inform all subscribers of the attitudes of the public in general. Finally, they must review and monitor programs, reach conclusions, make recommendations and refer charges to the Television Board of Directors concerning violations.[16] Mr. Frank Orme says these five persons are going to do all this, they are going to do it in their spare time, and that they are going to do it without pay. Obviously, this is an unworkable effort and the fact that only $40,000 has been set aside by the NARTB for the complete operation of the code does not improve the picture.

Nothing in the code provides the public with safeguards against arbitrary or capricious actions by the censorship board. Furthermore, the board, through its secrecy laws, can discriminate against any station, against competitors, or against producers of shows. Moreover, the code permits a broadcaster to carry any program, regardless of whether or not it violates the code, until the legal cancellation of its contract with a network or advertiser. Obviously, the NARTB has not provided a working code for broadcasters. It is also obvious that the broadcasters as a group have failed to realize the significance to the audience of mass communications. Legally, the controlling power of television rests with the people of the United States. Television channels are, of course, public domain properties. All broadcast channels must remain legally with the public and active public interest

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[16] Ibid., p. 21.

and public understanding of this is of highest importance.[17]

> We cannot expect the elimination of mediocrity in programming because it is a physical impossibility to produce 100 percent masterpieces. We can, however, expect and demand the elimination of sadism televised for children; we can demand elimination of excessive and semi-fraudulent advertising. We can obtain more quality programs by actively supporting the sponsors of such programs.[18]

III. EDUCATIONAL TELEVISION

On March 22, 1951, the Federal Communications Commission proposed that 209 television channel assignments scattered throughout the states and territories should be reserved for operation by educational organizations. A week later, the Joint Committee on Educational Television was organized on a continuing basis. Through the JCET, the American Council on Education participated in hearings in connection with other organizations which led to the FCC proposal to reserve educational channels. These other organizations included the Association for Education by Radio, the Association of Land Grant Colleges and Universities, the National Association of State Universities, the National Council of Chief State School Officers, and the National Educational Association. The Joint Committee on Educational Television was formally established on April 1, 1951 and a grant of $90,000.00 was received by the American Council on Education in behalf of JCET from the Fund for Adult Education. The Fund for Adult Education in its turn receives its money from the

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[17] Ibid., p. 217.

[18] Loc. cit.

Ford Foundation.

The American Council on Education is charged with receiving and disbursing funds. Chairman of the Committee is Edgar Fuller, Executive Secretary of the National Council of Chief State School Officers. Subsequently, the original proposal of 209 television channels was increased to 244 and the latter number was reserved. On April 14, 1952, a total of 552 colleges, universities, school systems, and public service agencies representing all of the states filed with the FCC a total of 349 statements in response to the Commission's proposal for reservation. In response to the demands of JCET, a field service was organized to aid educational organizations with legal, engineering, and programming advice during the Spring of 1952. Among other activities of the JCET was the organization of a national, and six regional conferences designed to promote the activities of educational television.[19]

Programming of educational TV stations has also been discussed in considerable detail. Dr. Franklin Dunham, Director of Radio and Television for the United States Office of Education, proposed that a list of rights belonging to free communication should be incorporated into all educational planning.[20]

Among these rights proposed by Dr. Dunham as a basis for edu-

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[19] The Educational Record, Vol. 33, No. 3, July, 1952, pp. 299-2309.

[20] "The First Draft of Declaration of People's Rights in Radio and Television," March, 1952, Annals of the American Academy of Political and Social Science.

cational programming were the following: (1) The right to free communication; (2) The right to receive unbiased news; (3) The right to hear all sides of controversial questions; (4) The right of access to all programming; (5) The right to wholesome entertainment; (6) The right of every citizen to find available some legitimate information whenever he tunes in; and (7) The right to demand standards of taste within the standard of decency to which lip service is paid by radio and television.

These rights obviously have no legal standing or at best vague legal standing, but on the other hand, they appear desirable to large numbers of persons. In addition to this, Dr. Dunham is suggesting programming standards for educational TV stations.[21] Among the things which he suggests that educational TV stations must do are (1) direct teaching, (2) dramatized research, (3) news background, (4) programs of cultural value.

It might be further noted in connection with interest in broadcasting by educational institutions that there are 420 different institutions of collegiate ranks which are offering courses in radio and there are 60 which are offering courses in television. Forty more are offering courses in television engineering.[22]

As of this date (August, 1953), some 60 educational institutions have applied for licenses for television stations. Of these 60, at least

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[21] Franklin Dunham, "The Obligations of an Educational TV Station", The Educational Record, Vol. 33, No. 3, July, 1952, p. 22.

[22] A Directory of Colleges Offering Courses in Radio and Television, (Washington 25, D. C.: Federal Security Agency, Office of Education), pp. 51-55.

29 have their planning and purchase of equipment in an advanced stage and one, the University of Houston, is now broadcasting regularly.[23]

IV. SUMMARY

In summarizing this section, it might be said that paralleling the instability of present technical developments is the apparent diversity of thought regarding the optimum type of television programming.

Naturally, the commercial interests ask only that their programs show a high financial return. Their chief reason for a self-regulatory system seems to be than an outraged public opinion will eventually instigate legal regulation. The latter they fear for obvious reasons.

The non-commercial interests appear to want several other types of programming but are in considerable disagreement as to what is preferable. Educational television may serve to resolve these differences.

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[23] George L. Arms, "Programming Policies of the University of Houston," (unpublished report, The University of Houston, Houston, Texas, May, 1953).

CHAPTER V

RECENT DEVELOPMENTS IN TELEVISION

Experimentation in television has not ended. Indeed it appears that it will go on into the indefinite future. It is possible that the end result of television may be a three-dimensional color picture of high definition on a very large screen bringing in a multiplicity of programs from all over the world. The developments which may make all of this possible are described in this section.

I. FOREIGN TELEVISION EXPERIMENTATION

Hubbell is the authority for the statement that the British Broadcasting Corporation in the year 1940 at the outbreak of the Second World War had taken the lead in the first high quality television service which the world had ever seen.[1] The history of British television actually dates back to the early work done by John Baird and others in the 1920's, some of which has previously been noted.

In 1929, the British Broadcasting Company decided to assist the Baird Television Company in television experimentation. Low definition pictures of 30 lines definition were broadcast in that year. In 1930, sound was broadcast along with the picture. In 1933, separate and com-

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[1] Richard W. Hubbell, Television Programming and Production (New York: Murray Hill Books, 1950), p. 159.

pletely equipped studios were made available.[2] In a report issued in January, 1939, a committee appointed by the Postmaster General recommended that the British Broadcasting Company should be responsible for television and that a national television service should be established at an early date. The cost of television was to be borne by the revenues existing from government license fees on radio receivers. Two competing companies, one run by Baird, and another by Marconi's successors, were using the Zworykin and Farnsworth methods respectively.

In 1937, a 405 line definition was standardized and numerous favorable public reactions were obtained.[3] As early as 1938, it was possible in London to buy a television receiver with a fourteen inch screen, plus an all wave radio receiver, for approximately $400.00 and large screen receivers were on sale for approximately $1,000.00. By 1938, the British Broadcasting Company had spent approximately $4,000,000 in two years of operation, and in that same year television service was extended from London to Manchester. The television programs were of such a nature that 90% of the television audience when asked its opinion of the programs replied that it considered them excellent.[4] At noon on September 1, 1939, however, all British television was closed down and did not return to the air until 1946.

Other foreign broadcasting was notable in numerous other countries

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[2] Richard W. Hubbell, 4,000 Years of Television (New York: Murray Hill Books, 1942), p. 160.

[3] News item in the London Times, January 7, 1938.

[4] Loc. cit.

from Argentina to Iceland. Notable among these nations was Holland which, with the construction being handled by the Phillips Company, was broadcasting iconoscope pictures with 180 lines definition as early as 1935. By 1938, they were broadcasting on a 450 lines definition. Again television was closed down at the outbreak of the war.[5]

Television experimental broadcasting in France had been started in 1932 by an affiliate of the John L. Baird Company and by 1935, a television transmitter had been installed atop the Eiffel Tower which was connected with the studios over a mile away by coaxial cable. By 1937, 401 lines definition was standardized in France and in April, 1938, a coaxial cable joined Paris, Bordeaux and Toulouse.[6]

The J. L. Baird Company again pioneered television expansion in Sweden, starting these activities around 1930, and private engineering concerns in Sweden, aided by the Phillips Company of Holland, had brought considerable television experimentation to Sweden by 1939. Television in Poland had also made some progress.[7] And the Russians in 1937 with Radio Corporation of America equipment had also made tremendous progress. Among other nations actively working before the war in the field of television, we should mention Iceland, Australia, Canada and Argentina.

The Germans made, as early as 1935, a claim to having achieved leadership in television, by the use of the Farnsworth patents in agree-

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[5] Richard W. Hubbell, 4,000 Years of Television (New York: Murray Hill Books, 1942), p. 171.

[6] Ibid., p. 172.

[7] Ibid., p. 175.

ment with certain German patents owned by Fernseh.[8] By 1935, the Associated Press was able to report that the Nazi government hoped to use television widely to cement its grip in Germany.[9] Again the name of John L. Baird as one of the pioneers of television crops us since the Fernseh Company was founded by Baird and others in 1929. In September 1937, a coaxial cable was laid between Berlin and Nuremberg and it was at that time the longest coaxial cable in the world.[10] Moreover, a telephone-television "see and talk service" was available to Germans in 1937 and in this respect the 1937 achievement of the Germans stands as commercially superior to anything done in this country to this date. It is worth noting that the price of this "see and talk service" only doubled the price of an ordinary long distance call.

One feature of German television appeared to be considerably behind that of Great Britain, in that as late as 1938, the Germans were using a mechanical scanning system which the British had discarded at least a year earlier.[11] However, by November 1, 1938, a 441 line picture service using patents of Farnsworth and Baird was formally placed in service,[12] and in the summer of 1939, the Germans were reported preparing to build new television stations in Hamburg, Munich and Vienna. Again, the coming of war called a halt to this development. It is worth noting

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[8] News item in the New York Sun, April 20, 1935.

[9] Associated Press dispatch, April 27, 1935.

[10] Richard W. Hubbell, 4,000 Years of Television, (New York: Murray Hill Books, 1942), p. 181.

[11] Ibid., p. 183.

[12] Ibid., p. 184.

that progress in television in foreign countries since the war has not been as extensive as such progress in this country. A large part of this is due to the enormous cost of such progress which, since the war, foreign countries have been unable to finance. However, it is worth noting that the French now have a 900 line system which is infinitely superior in definition to anything this country is now using and that the British are now considering, according to the British Information Service, establishment of similar definition. Personal reports from friends in Germany indicate that the Germans will have fewer television stations than ours in proportion to population but will probably have higher picture definition than that available in the United States for some time to come. It is notable also that since the war four television stations have been put into operation in Argentina and twelve in Mexico, and that television appears to be sweeping the entire world at this time.

In support of this last statement, it may be noted that according to Broadcasting and Telecasting Magazine France continues to transmit a public television service on an over 900 line basis from Paris, giving a far clearer picture than is available in this country. In England, a third transmitter in the North was added to the two transmitters for the South which were already operating on 405 lines. Moreover, public services on 625 lines were established in Western Germany in June and in Denmark and Holland in October.

Spain began transmitting regular service from Madrid and Barcelona in June, 1952. Arrangements were made to establish a television link between Paris and London and this went into operation in October, 1952.

British television coverage now approximates 60% of the entire population of Great Britain and more television transmitters to cover the entire British Isles population are now envisaged.[13]

II. THEATER TELEVISION

Installation of theater television in the United States has increased substantially over previous years. At the end of 1951 approximately 60,000 theaters had installed equipment. Sporting events of widespread interest were presented in about thirteen cities exclusively by theater television. As a result competition developed between the theaters and television broadcasters for rights to sporting events of general interest. The Federal Communications Commission announced that a hearing to determine whether or not a frequency band should be allocated to theater television would be held. Hearing time has been postponed up to this date.[14]

III. SUBSCRIPTION TELEVISION

In January, 1951, the Zenith Radio Corporation and its President, Commander L. R. McDonald, obtained an experimental authorization from the Federal Communications Commission to conduct public tests of its system of subscription television in the Chicago area. The system known as phonevision involved the transmission of a program over a regular tele-

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[13] Broadcasting and Telecasting Magazine, July 16, 1953, p. 17.

[14] Ibid., p. 19.

vision station which is "scrambled" in such a way that it cannot be received satisfactorily in the normal manner. A coded signal is transmitted via telephone lines to the homes of persons desiring to subscribe to the phonevision service. This signal is applied to the receiver to "unscramble" the program. A fee is charged for each program received in this manner. The Zenith tests lasted for three months and were received in about 300 homes. The programs consisted of grade A motion picture films not previously shown on television. A fee of $1.00 per film was charged. The results of these tests were to be submitted to the Federal Communications Commission. Other subscription television systems were proposed. Skiatron Corporation of New York tested its system over twenty two hundred sets during 1951. The Skiatron system, known as "Subscriber Vision," differed from phonevision in that telephone connections were not required. It inserted a coded card in a receiver equipped with the necessary decoding device.

IV. STRATOVISION

Experiments have also been conducted to see how feasible it might be to provide television service by stratovision, which is a system of airborne television. Planes have been sent up to cruise around a twenty mile circle at an altitude of 20,000 feet. It has been estimated that 33 planes flying at this altitude and carrying transmitters would serve about 99% of the population of the United States. It is further estimated that the cost of operation would compare favorably with that of

operation on the ground.[15] The Federal Communications Commission's comment on this was considered by Siepman to be a masterpiece of understatement. "This mode of operation poses technical, economical and social problems."

Dr. Dallas Smythe states:

> The ultimate issue upon which the possibility of stratovision rests is that of public policy. Those forces which, in respect to radio have opposed power in excess of 50 kilowatts have expressed opposition to stratovision on the argument that to give the operator of stratovision over television program service would be to cast too much political, social and economic power into too few hands.[16]

V. COLOR TELEVISION

As we have noted crude pictures in color were shown by J. L. Baird in England and H. E. Ives in the United States as early as 1930. During the ten years which followed, experiments in color were undertaken by most of the major research laboratories. Public demonstrations of school programs were made in 1940 by the Columbia Broadcasting System. As commercial television was re-established immediately following World War II, experimental color television transmissions were demonstrated. However, it was generally concluded that color television had not reached a point in its development where it would be successful in general

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[15] Charles Siepmann, Radio, Television, and Society (New York: Oxford Press, 1950) p. 323.

[16] Dallas Smythe, "Television: Position and Outlook," Current Economic Comment (Urbana: University of Illinois Press, 1949), vol. 11, no. 1, p. 21.

television broadcasting at that time.[17] Furthermore, the program material that could be presented was considerably reduced at that time because of the amount of light required. Moreover, the cost of color television would be much higher. Yet, according to Garnet Garrison in private conversations with the writer, in spite of these difficulties, such obstacles do not appear to be insurmountable and there is every reason to believe that the black and white television pictures of our present period will rapidly be supplanted by color television.[18] Indeed, in 1950 the Federal Communications Commission's report on color television approved a mechanical color television system devised by the engineers of the Columbia Broadcasting System. Great objections to this system were raised because it involved a synchronous rotating disk at both the sending and receiving ends of the transmission. At this same time, the Radio Corporation of America came out with a compatible color system which had every merit except that it could not transmit true color. Court proceedings challenging the Federal Communications Commission's right to make such a decision were established. On December 20, 1950, the 39th District Court by a two to one majority sustained the Federal Communications Commission.[19] This decision was appealed to the Supreme Court by the Radio Corporation of America and

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[17] Giraud Chester and Garnet Garrison, Radio and Television (New York: Appleton-Century Crofts, 1947), p. 39.

[18] Ibid., p. 41.

[19] A decision Adopted by the FCC in 1950 in favor of CBS Television System, 39th U.S. District Court.

in May 1951, the Supreme Court affirmed the District Court's judgment. The Federal Communications Commission's order provided that the door was still open on color systems provided they could meet certain criteria, and in June of 1951, the Columbia Broadcasting System announced a schedule for the production of color television receivers. A special request for materials was submitted to the National Production Authority but on October 19, 1951, Charles E. Wilson, Director of Defense Mobilization, denied the request. The Columbia Broadcasting System immediately announced that it would comply and would discontinue color television programs.

This matter is still in dispute, but other scientific developments, notably those of a California group headed by D. L. Lawrence, a Nobel Prize winner in physics, seem promising at this time. The Lawrence system will transmit true color reproduction in a compatible system and in an electronic rather than a mechanical manner. Other developments are expected momentarily in this field.

VI. THREE DIMENSIONAL TELEVISION

The following report on Three Dimensional Television comes from the International News Service Dispatch and contains about all that is presently known about this matter:

> Los Angeles, April 29..Three Dimensional television was demonstrated today for the first time in history.
>
> American Broadcasting Company engineers transmitted a special 15-minute program from its KECA-TV studio in Hollywood to a select audience in a crowded room of the Biltmore Hotel in downtown Los Angeles.

Observers were not exactly ready to go along with what one ABC official earlier termed possibly "TV'S answer to Hollywood's answer to TV."

But the added dimension of depth definitely was on the screen, despite the difficulties of focusing the picture and other technical problems.

Viewers donned polaroid glasses, as in the case of 3-D movies, to get their first look at 3-D TV. But they had to turn their glasses upside down to get the best illusion because of an electronics problem.

The receiver consisted of two video tubes which flashed the pictures on a 36-inch screen through polaroid lenses.[20]

VII. INDUSTRIAL TELEVISION

According to D. G. Fink in his work "Principles of Television Engineering" published in 1940, television has certain attributes which make it an essentially important tool for industry and science. Two features in particular give it unique value. First, its ability to transfer the eye of the observer to a remote point, and second, its ability to observe in places human beings cannot enter. The obvious application of the first feature is where the object or operation is so located as to be inaccessible to human observers.

Two examples of this type of application could be noted. First, the Bikini atom bomb test of 1946 in which human observers had to be located on ships at a safe distance. The television system operated perfectly during the explosion from very close range. The second application was the British Navy's using underwater television cameras to locate sunken

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[20] International News dispatch, April 29, 1953.

submarines. In industrial operations, the same principles may apply in televising operations associated with the manufacture of explosives, corosive chemicals, or poisonous materials. The possibility of multiple presentation has been found advantageous in closed circuit broadcasting of medical operations which can be viewed by various doctors in remote cities. Police stations have installed television cameras in jail cells to observe the activities of prisoners, and industries are now installing them in order to prevent undue waste of time by factory laborers. Certain labor leaders in private conversations with the writer have expressed uneasiness over this last use.

It appears now that there are tremendous potentialities in this field which will be developed fairly rapidly from this time on.

III. SUMMARY

In this chapter we have noted that European experimentation is, in respect to number of scanning lines and telephone television, far ahead of developments in this country. It has also been noted that color television and theater television are making substantial progress. Progress in stratovision has been slight up now and third dimensional television has only started. However, industrial television is growing vigorously and may yet become an extremely important component of the entire future of television.

CHAPTER VI

SUMMARY AND TRENDS

The scientific discoveries which made television possible were joint products of the minds and ingenuity of many men from numerous nations. Greeks, Arabs, Italians, Germans, Swedes, Englishmen and Americans all made contributions. As in the case of most sciences the progress in electronics has tended to snowball and more progress has been made in the past one hundred years of television than in the preceeding four thousand. Part of the reason for this is to be found in the necessity for progress in so many fields before as complex an invention as television could be made. A basic understanding of electronics, optics, magnetism, photographic principles, physiology and many other fields was essential before a television transmitter could be built.

Also essential for the widespread use of television is a large accumulation of capital. In the ancient and medieval worlds, it is doubtful if even the state had such accumulations. In our day the state and private corporations both have the requisite capital. It is not surprising that, since huge profits were potentially or actually involved in radio and television, large corporations should struggle for the control of the industry. What might surprise certain theorists is that the struggles have been peacefully resolved to the benefit of the people at large. Perhaps the most potent force in this peaceful resolution has been the influence of government through regulatory bodies

(FCC and ICC), law (Clayton and Shermann Anti-Trust Laws), and the Federal Courts.

In terms of programming, there has, perhaps, been less cause for general satisfaction. The industry has adopted a negative concept of self-regulation in its NARTB Code. It has done relatively little of a positive nature to insure that high standards of programming are encouraged. In this connection however, a ray of hope may be evident in the beginnings of educational television. Free from commercial pressures these stations may, by their programming, be able to instill in commercial station owners a more positive approach to vital presentation of the cultural values of our day.

New discoveries and inventions and new applications of older ones are very evident in the television field. Some of these, such as subscription and theater television are attempts to find new sources of revenue for programming. Others like additional scanning lines or stratovision are simply attempts to improve and raise present technical standards. Still others like color and three dimensional television have a combination of both of these factors in view. One cannot be certain of which of these new developments will be important and which will be forgotten.

The technical trends in television are relatively easy to define. The picture will be better. There will be more scanning lines, less halation, color will be added, visual static reduced. The picture will also probably be bigger and large screen television will be with us very soon. Transmission will be made cheaper and easier by using electronic

devices to take the place of engineers. Mass production will probably eventually reduce costs for both producer and consumer.

Business trends for the industry may be noted as follows: Intense competition in manufacture of equipment, programming and sales. Government regulation will continue. Intense research subsidized by the industry will continue since that is a primary means to a better product which will out-sell competitors. It is doubtful if destructive industrial conflict such as that noted in Chapter III would be permitted today.

Programming trends continue to favor the mass or "lowest common denominator" audience and no great change in this is to be expected from the industry as long as the advertising of mass products continues to carry most of the financial burden. However, educational television, theater television and subscription television all have strong possibilities for the cultural minority. Moreover, an additional number of stations which cannot be served by a network may also force program changes.

Thus, it must be noted that while technical progress in television will undoubtedly continue, the basic problems of programming remain. The industry will undoubtedly be able to produce a larger, clearer, brilliantly colored picture. It may devise techniques of production which will cause our present methods to be regarding as historical curiosities.

As further progress is made in the use of lighting, scenery, superimpositions and depth perception the illusion of reality may become almost unbelievably powerful. Indeed it is possible that visual and aural

sensations may even be combined with tactile and kinesthetic senses. All of this may be excellent in its way but still the basic problem remains.

The problem of programming may be briefly stated in this question. In whose service are all these techniques to be used? Are they to be used, as at present, almost exclusively to sell toothpaste and motor cars to a mass audience or are they to be used to bring a higher perception of moral and aesthetic values to our people? As of this moment the answer would seem to be in favor of those who advocate the continuous repetition of the names and characteristics of products intended for mass distribution.

At this point it might be well to note the possibilities for future research in this field. First in the list should be a complete history of programming. This might serve a very useful purpose for those now planning and supervising programs. It might also indicate new directions possible in that field.

Also, educational television is only now beginning its history. Here again is a field for the future researcher. Studies in audience response to different types of programs, especially in respect to the intensity of feeling involved, are still in their infancy. A mere counting of listening ears is unsatisfactory to the producer and should be unsatisfactory to the entire industry.

In conclusion it should be said that more research is needed in all aspects of this tremendously powerful medium. Only by constant and devoted research can we hope to understand this important aspect of communications. And only by developing our understanding of the entire

process of communication can we reach those moral values toward which we all aspire.

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APPENDIX

APPENDIX

GLOSSARY OF TERMS

Announce booth or Announcer's booth - a soundproof booth in which an announcer sits at a special microphone and reads announcements or narration on cue.

Balop. (Originally an abbreviation for Balopticon) - a Bausch and Lomb optical projector which can project either transparent or opaque slides into a film pickup camera in the projection room -- has come to mean any type of opaque projector.

Board Fade - a radio term, used to designate the process of gradually fading the folume of sound by means of a master fading control on the audio console or "board".

Business (originally "stage business") - any specific action or pantomine.

Bust shot or chest shot - a shot which covers a person from the chest to just above the head.

Cue line - (1.) a private telephone line from the site of a remote pickup back to the home station or between any two remotely separated production points which must be coordinated.

(2.) a line which carries the station's or network's on-the-air program, usually previewed in the control room immediately before going on the air to know exactly when the preceding program is off the air and it is time to begin.

Cyc. (short for cyclorama) - a semi-circular drop curving around the back of a set and usually stretched tight without wrinkles to represent a sky or a neutral background.

Dolly camera - a camera mounted on a dolly which permits it to be moved easily about on the studio floor and to be raised, lowered, swung about, and otherwise manipulated by two or more operators.

Drop - a curtain, drape, or flat canvas on which a scene is painted, usually suspended from the flies or catwalk or a studio.

Dry run - a rehearsal without the use of cameras, held either outside or in the studio.

Feminine stanza - trade journal jargon for a woman's program.

Film clips - shots or sequences on film, either specially shot for a given program or cut from stock footage in the possession of film libraries.

Film gate - the opening in the mechanism of a motion picture projector through which the projection light is directed and in front of which each individual frame of film pauses while it is projected on the screen.

Film loop - a short section of film, usually six or eight feet in length, of a repeating subject such as a waving flag or a spinning globe. The beginning is spliced to the end so that the film may run endlessly through the projector for as long as needed.

Flat - a wooden frame, covered with canvas and then painted, the basic unit of scenery.
Double-fold or two-fold flat - two such flats hinged side by side, with the joint covered by canvas.

Fluffs, flubs, bobbles - errors in acting, lines, direction, or any phase of production.

"Fly the drop" - a command to hoist a given drop up and out of sight of camera range.

Frame - Film--each separate rectangle of film or strip film.
Television--one entire scanning cycle of 525 horizontal lines, creating a still picture every 1/30 of a second
Camera direction--adjust the composition properly when the adjustment is obvious as in "frame up"; broadly, compose.

Gain - strength of current, as in the phrase "to boost the gain" of a microphone, which makes the sound louder, or the phrase "to boost the gain of a picture," which makes it brighter and brighter.

Intercut - (1.) a brief shot which is interjected into the visual continuity, as the reaction of spectators during a sports event,
(2.) one of a series of shots which alternate between two or more subjects, cutting back and forth, i.e., intercutting.

Kill - to turn off a light; to do without a prop or an effect; a decision not to use something originally planned.

Knee shot - a shot which covers a person from the knees to just above the head.

Lap. (as in lap dissolve) - a film expression used to describe the overlapping of two scenes. TV usually calls it a "dissolve".

Leader - blank or numbered film attached to beginning or end of a reel or segment of motion picture film.

Low key lighting - lighting which is subdued, giving the effect of night or of dim illumination.

Monitor - in audio, a speaker on which control-room personnel judge quality of sound.
in video, a screen on which control-room personnel judge quality or content of the picture.

To Monitor - to watch or listen critically or for purposes of getting cues.

O. S. - (1.) off stage - a voice or action which takes the place outside the set.
(2.) off screen - a voice or sound heard but not seen.
(3.) over-the-shoulder shot - a shot of one person taken over the shoulder of the person he is addressing.

Package - a complete program; idea, script, music, talent, etc. sold to a station or network as a unit for a fixed fee. Out of this the "package" or package film produces the show, pays writers, actors, singers, etc.

Spot announcements or "spots" - brief announcements, usually commercials, inserted in between two programs or program segments.

Stock shots - film footage of standard scenes. (Hundreds of subjects are stocked in film libraries.)

Strike - as to "strike a set" or "strike a prop"; to remove, clear away, or dismantle anything on the set.

Superimpose - the effect obtained by blending the pictures being shot by two cameras so that one image is imposed over the other, and both go out on the air simultaneously.

"super in sync." - superimpose in synchronization so that the picture or lettering appears on the screen at the same time as the appropriate words are spoken.

sync. - abbreviation for synchronization.

tel-op. - a manufacturer's name for an opaque slide projector.

Templet. - a cardboard or metal pattern for copying drawings or designs.

time sales - the process of securing revenue for a radio or television station by selling air time to a sponsor.

Traveler - a track or other device for suspending a pair of draw curtains which may be opened or closed on cue.

Traveler curtains - curtains designed to be suspended from a traveler.