History of Communications Media

Class 7

History of Communications Media

- What We Will Cover Today
  - Finish Up Movies
    - What Television Did to the Movies
  - Radio
  - Phonograph
  - Television

Movies and Television

- What Television Did to the Movies
  - While the Studios initially saw television as a mortal threat, independent movie producers saw TV as an opportunity
    - The independents began making films – mostly crime dramas, westerns, and comedies – for television
      - Among the most successful was Desilu Productions
    - The success of Disneyland with the theme park, TV programs, and movies mutually promoting each other led studios to see television as a potential ally

Threat - When ABC President Robert Kintner tried to persuade Harry Cohn of Columbia Pictures to supply original programming, Cohn said, 'You dumb son of a bitch, you won't get any of my stars, you won't get any of my people -- you can't make films! People want the companionship of the theater, they want their movies the way they are -- not on TV.' **Opportunity –** The independents realized that *filmed drama could earn for its producers more money than live programming ever could. Under a practice known as syndication, a producer would sell rerun rights to the network and to groups of local stations*." From the late 1940s on, independent producers began setting up shop on lower Sunset Boulevard in Hollywood and started cranking out cut-rate price films (mostly crime dramas & westerns) for television***. Tempted by the huge profits that could be made, many Hollywood producers made the switch to independent television production. Among them were two former RKO contract players -- Lucille Ball and Desi Arnaz -- who formed Desilu Productions***. By 1955, they were turning out hundreds of hours of programming every year, including *I Love Lucy.*

Movies and Television

- What Television Did to the Movies
  - Movie studios began renting their archives of old productions to the networks
    - Feature films on television
    - Studios invest the archiving, preservation, and restoration of old feature films
    - Films made for television without exhibiting them in theaters beforehand

Movies and Television

- What Television Did to the Movies
  - Television changed the economics of the movie business
    - Before television, box office revenues were the source of movie profits
    - After television, it is primarily video (initially VCR tape and now DVD) rentals and sales that are the source of profit, followed by box office revenue and sales of exhibition rights to free and pay television. In some cases, there is additional revenue from product tie-ins.

In 1993, U.S. figures place pay and free television at 19 per-cent of cinematic revenues, movie theaters at 27 percent, and home video at 49 percent. Disney popularized the use of tie-in products with his movies – movie character dolls and figurines, photographs of stars, games based on the movie and/or movie characters. In 2003, they accounted for only 18% of the take. Instead, home entertainment provided 82% of the revenues. Further, print and advertising costs eat away most if not all of the theatrical revenues, but the studios retain most of the money from home entertainment. All of this has transformed the way Hollywood operates. Theatrical releases now serve essentially as launching platforms for videos, DVDs, network TV, pay TV, games, and a host of other products

Radio

- Origins of Radio
  - James Clerk Maxwell's theory had predicted the existence of electromagnetic waves that traveled through space at the speed of light
  - Heinrich Hertz in 1886 devised an experiment to detect such waves.
    - Hertz showed that radio waves conformed to Maxwell's theory and had many of the same properties as light except that the wave lengths were much longer than those of light – several meters as opposed to fractions of a millimeter.

Hertz - Heinrich Hertz (1857-1894) deduced from James Clerk Maxwell's theory that electromagnetic waves, generated by a changing or oscillating electric current, traveled through space with the same velocity as light. This suggested an experiment. He connected two ends of a coil of wire to the opposite sides of a small gap and then shot a high-voltage spark across the gap. Hertz found that as the spark jumped the gap, a much smaller spark flowed between two other wires, similarly configured, on the other side of the room.

Radio

- Origins of Radio – 2
  - Guglielmo Marconi had attended lectures on Maxwell's theory and read an account of Hertz's experiments
  - Marconi replicated Hertz's experiments and then
    - Added to the smaller spark gap a Branly coherer (which acted as an amplifier), a battery, and a Morse printer.
    - As a result, created a wireless telegraph that recorded transmitted messages in the dots and dashes of Morse code

Although much work was being done on Hertzian waves, it was in physics and not technology. It was left to a wealthy young Italian, barely out of his teens, to convert these scientific developments into a revolutionary method of transmitting information. Guglielmo Marconi (1874-1937) had attended Augusto Righi's lectures at Bologna University on Maxwell's theory and on Hertz's experiments; and he had read Lodge's London lecture on Hertz's experiments. He could, he said later, hardly credit that the great men of science had not already seen the practical possibilities of Hertzian waves; but, as Lodge later confessed, they had not. ***Marconi, in short, was the typical outsider who, having no prior connection with an art or technology, revolutionizes it.***

Marconi's radio - After Hertz's death in 1894, Marconi replicated Hertz's experiment and then added to the smaller spark gap a Branly coherer [a tube invented by Edward Branly in 1891 with electrical contacts at either end and a metal dust suspended in the middle that was used as an amplifier of telegraph signals], attached the Branly coherer to a battery, and the battery to a Morse printer. Here in primitive form was a wireless telegraph, set to record messages in the dots and dashes of Morse code that were beamed electronically from a transmitter across the ether to a receiver.

Radio

- What Marconi accomplished
  - He devised a practical wireless telegraphy transmitter and receiver
  - He also visualized a market for the device
    - Navies and shipping companies that wanted to be able to communicate with their ships at sea
  - Marconi gradually improved his invention over time
    - In 1901 actually transmitted a message from Cornwall in England to Newfoundland
      - » This led to the discovery of the ionosphere since what Marconi accomplished was theoretically impossible if radio waves like light followed lines of sight.

Radio

- What Reginald Fessenden accomplished:
  - Fessenden and Ernst Alexanderson of GE developed a high-frequency alternator that allowed continuous wave transmission
  - This made possible voice and music radio transmission
    - On December 24, 1906, Fessenden began transmitting voice and music from his experimental radio station in Plymouth MA.

Radio

- What Lee De Forest accomplished:
  - Invented the audion tube, which permitted the detection and amplification of radio signals and sound
  - Started radio broadcasting of lectures and phonograph music in 1915
    - In 1916, he broadcast the Harvard-Yale football game and the 1916 Presidential election results, including the incorrect report that Woodrow Wilson had been defeated
    - In 1917, with the declaration of war, all amateur broadcasting was shut down
  - Invented the Phonophone sound-on-film method of recording talking pictures

Audion tube - Audion, a vacuum tube that takes relatively weak electrical signals and amplifies them. De Forest is one of the fathers of the "electronic age", as the Audion helped to usher in the widespread use of electronics.
De Forest's innovation was the insertion of a third electrode, the grid, in between the cathode (filament) and the anode (plate) of the previously invented diode. The resulting triode or three-electrode vacuum tube could be used as an amplifier for electrical signals, notably for radio reception. The Audion could also act as a fast (for its time) electronic switching element, later applicable in digital electronics (such as computers). The triode was vital in the development of long-distance (e.g. transcontinental) telephone communications, radio, and radar. The triode was an important innovation in electronics in the first half of the 20th century, between Nikola Tesla's and Guglielmo Marconi's progress in radio in the 1890s, and the 1948 invention of the transistor.
Phonophone - These lines photographically recorded electrical waveforms from a microphone, which were translated back into sound waves when the movie was projected. This system, which synchronized sound directly onto film, was used to record stage performances (such as in vaudeville), speeches, and musical acts. In November 1922, De Forest established his De Forest Phonofilm Company at 314 East 48th Street in New York City, but none of the Hollywood movie studios expressed any interest in his invention. De Forest also worked with Freeman Harrison Owens and Theodore Case, using Owens's and Case's work to perfect the Phonofilm system. However, DeForest had a falling out with both men. Case took his patents to studio head William Fox, owner of Fox Film Corporation, who then perfected the Fox Movietone process. Shortly before the Phonofilm Company filed for bankruptcy in September 1926, Hollywood introduced a new method for sound film, the sound-on-disc process developed by Warner Brothers as Vitaphone, with the John Barrymore film *Don Juan*, released 6 August 1926. In 1927 and 1928, Hollywood began to use sound-on-film systems, including Fox Movietone and RCA Photophone.

Radio

- Effects of World War I
  - Sparked a huge demand for both wireless equipment and trained radio operators
    - Trained thousands of radio operators and familiarized them with the latest developments in radio technology
    - Led many of these new radio operators to become postwar amateur radio operators or hams.
  - Wartime desire to intercept German radio communications inspired Edwin Armstrong in 1918 to invent the superheterodyne circuit
- WWI thus laid the groundwork for the 1920s boom in radio and radio broadcasting

Demand for radio equipment and operators - World War I sparked a huge demand for wireless equipment -- millions of vacuum tubes, thousands of transmitters, large numbers of receivers and head phones. These demands were met by General Electric, Westinghouse, and Western Electric (the manufacturing subsidiary of AT&T). Also, thousands were trained as radio operators. In January 1917, there were 970 Navy radiomen; on November 11, 1918, there were 6,700.

Superheterodyne circuit – The circuit was an effective tuning device for electromagnetic signals that remains to this day the central element in radio and television transmission at precise and differentiated frequencies. Prior to Armstrong's invention, each radio transmission covered a range of frequencies, thus hogging spectrum space and interfering with other radio transmissions

Radio

- Frank Conrad
  - Was an amateur radio operator who was head of Westinghouse's radio operations
  - Regularly broadcast music from his home radio station
  - Joseph Horne Department Store Ad ran an ad on September 20, 1920 saying that their sets could receive Conrad's transmissions
  - The ad triggered an epiphany in Westinghouse VP Harry Davis
    - Radio was a broadcast medium
    - There was money to be made in selling receiving sets

When Harry P. Davis, a Westinghouse vice-president, saw the ad, he suddenly grasped that the company's concep-tion of the wireless market had been much too limited in scope. He realized that "the efforts that were then being made to develop radio telephony as a confidential means of communication were wrong, and that instead its field was really one of wide publicity, in fact, the only means of instantaneous communication ever devised." He now com-prehended that the amateurs did not represent a discrete market limited to technically inclined boys and men; rather, the amateurs were simply the forerunners of a much larger market for radio receivers. As Davis later remarked, "Here was an idea of limitless opportunity.

Radio

- Davis got Conrad to build a radio station at Westinghouse – KDKA – to transmit the 1920 election returns.
- Result – A splurge of radio broadcasting
- One broadcast that helped fuel the radio surge was the broadcast of the Dempsey-Carpentier heavyweight championship fight on July 2, 1921

Davis urged that Westinghouse authorize Conrad to build a more powerful transmitting station at the Westinghouse plant and that Conrad broadcast on an even more regular basis. These broadcasts, according to Davis's plan, would stimulate sales of radio receivers, and the profits from the sales would defray the cost of the station. Davis wanted the station completed by November 2, so Conrad could broadcast the presi-dential election returns. At 8:00 P.M. on November 2, 1920, the newly licensed station KDKA, operating at 360 meters, broadcast the election results. Amateurs listened enthusiastically, sometimes rigging up loud-speakers so friends and family members could listen, as well. To ensure that the broadcast had the right effect, both within and outside of the company, Davis provided Westinghouse officers with receiving sets, and also helped arrange for local department stores to have their radios tuned to Conrad's station. Newspapers in Pittsburgh and elsewhere took note of the event, but most newspapers and magazines ignored the broadcast. News of it was spread most rapidly and enthusiastically by word of mouth among amateurs and their families and friends. Over the next year and a half, the "broadcasting boom" swept the United States, beginning in the Northeast and moving south and west, reaching unprecedented levels of intensity by the spring of 1922

Radio

- Radio Sets
  - 1920 – Most radios were homemade crystal sets with earphones
  - 1922 – RCA Radiola – 6 tubes, amplifiers, and a superheterodyne tuner that required no external antenna and was simple to operate, but required a battery
  - 1928 – Console radio, fitted into a large wooden cabinet and sold as furniture, with plug-in circuitry and loudspeakers
  - 1930 – Relatively inexpensive table model radios

Radio

- Notes on Early Programming
  - Broadcasting of election returns, political party conventions, and major sports events
  - Music – both live performances and phonograph recordings – dominated programming
  - No regular news coverage
    - Newspapers refused to make wire service reports available to radio stations for broadcasting

From the outset, music filled much of radio's available broadcast time. Live performances of the parlor piano and vocal music of re-cent decades were most common at first, but classical music, espe-cially opera and orchestral performances, enjoyed frequent broadcast. While many Americans had joined in or at least heard the more popular music at home, in saloons and vaudeville theaters, or elsewhere, few had attended an opera or symphony concert. The au-dience that heard classical music with the low sound quality of early radio was soon eager for live performance. Between 1928 and 1939 the number of major professional symphony orchestras increased from 10 to 17; the total number of orchestras, including part-time less professional ones in smaller cities, grew from 60 to 286. Perhaps !! more significant, whereas musical instruction in public schools was almost unheard of in 1920, two decades later it was widespread. Thirty thousand school orchestras and 20,000 bands had sprung up. Radio was much more effective than the earlier technological in-novation, the phonograph, in building an audience for classical mu-sic. Until the long-playing record was developed in 1948, phonograph records could hold only about five minutes of music per side, creating difficulties in the presentation of all but the shortest classical works. Furthermore, by 1924 superheterodyne radios were producing better-quality sound than phonographs. Radio therefore I took the lead in presenting classical music. The phonograph indus-try went into a radio-induced slump that lasted through the 1930s. Radio also promoted the popularity of other forms of music. Both jazz and country music reached beyond the audiences they had known and evolved significantly as a result. Music that could be and often had been performed at home in the parlor included sentimen-tal songs, ballads, vaudeville and musical comedy tunes, and less-challenging operatic pieces. Such parlor music was familiar, traditional, and remained widely enjoyed by early radio audiences. The limitations of radio, however, reshaped this sort of music. Intense voices, especially high sopranos, had a tendency to blow out the tubes on radio transmitters. As a result, a number of singers developed a new soft, gentle style that came across well and soon became known as "crooning." Female singers such as Vaughn De Leath and Kate Smith as well as males such as Rudy Vallee and Bing Crosby built large and loyal audiences as they perfected the "croon-ing" style.

Radio

- A Note on Sports Broadcasting
  - The uncertainties of early radio required radio announcers who could fill airtime with a gift of gab if something went wrong
  - Since many radio announcers lacked an athletic background, the practice of having two or more announcers team up to report a game arose
    - One to describe the play-by-play action and the other to provide analysis, information on players, and 'color'.
    - With football, there was three announcers – one for play-by-play description, one for color, and a spotter to identify the large and constantly shifting cast of players on the field.

One early sports broadcaster was Ronald Reagan who broadcast baseball games by reading off the sports telegraph ticker and creating the impression he was broadcasting from the game. One time, he was broadcasting a baseball game when the sports ticker got interrupted. Reagan had the batter foul off pitch after pitch until the ticker resumed.

Radio

- In the 1920s, radio took on many of the characteristics that marked radio and later television during their heydays
  - Bandwidth allocations that favored well-heeled stations
  - Commercial advertising as a source of radio station revenue
  - Networks that provided programming to individual stations

Bandwidth - A major initial choice facing the FRC at its inception was the design of the spectrum -- how to divide the bandwidth allotted to broadcasting among different kinds of channels. Since broadcast channels needed to be 10 kHz apart, this meant that 96 channels could fit on the broadcasting band. Six of these were set aside for Canada. The number of stations that the remaining 90 channels could support depended on the location and power levels of broadcast transmitters. At a high power, only one station could occupy a channel; at moderate power, there could be several regional stations at the same frequency spread around the country; and at the lowest power level, many dispersed local stations could use the same wavelength. Thus, the greater the number of high-power or clear channels, the less the number of regional and local stations. Because clear channel stations required more expensive transmitting equipment, the interest in clear channels was greatest among the well-financed commercial broadcasters. !! Convincing the FRC to set aside clear channels was a high priority for the emerging national radio networks. Non-profit broadcasters, in contrast, preferred more affordable local stations. Since clear channels could reach rural listeners who otherwise might lack access to radio and also provide better reception for people with cheaper radios, there was a strong argument for clear channels

Commercial advertising & networks - Before 1927, stations were able to operate on minimal budgets. In 1925, the average station was on the air only five hours per week, most broadcasters operated at low frequency, and programming was inexpensive since many performers appeared for free and many stations paid no royalties to composers. By the late-1920s, regulatory and competitive pressures had sharply increased costs as stations moved to higher power levels, stricter engineering standards, and 17-hour daily broadcast schedules together with higher programming costs as listening audiences demanded higher quality programs and composers/musicians demanded payment of royalties. Without a license fee or tax support to bear its mounting cost, American radio was certain to be dominated by commercial broadcasters, and these broadcasters were bound to turn to networks to control programming costs and advertising to provide revenue,

Radio

- Networks
  - The 1920s and early-1930s saw the emergence of four networks – NBC Red (1926), NBC Blue (1928), CBS (1927), & Mutual (1934)
    - In 1943, NBC-Blue was sold off and became ABC
  - Networks gave advertisers access to a large national audience
  - Networks provided programming to the affiliated local stations
  - Programming was produced by the networks, individual sponsors, and increasingly over time by advertising agencies.

Networks gave advertisers of brand-name consumer products efficient access to a large national audience, and out of their advertising revenue they provided stations with a dependable stream of income to run the programs the advertisers sponsored. Networks also gave their affiliates a competitive advantage by supplying popular and high-quality programs at low or zero cost that unaffiliated stations in their local markets found it difficult to match. Networks had an economic logic, based on the relatively high cost of producing content (programming) compared to the costs of transmission and reproduction. The additional role of connecting national advertising and national audiences gave the networks an unbreakable hold on broadcasting. With advertisers came increasingly influential ad agencies. Although the agencies started out by preparing copy for the radio advertisements and negotiating with stations on behalf of sponsors, they quickly assumed the central role in program production. Increasingly, the agencies came up with the ideas for programs, wrote the scripts, hired the performers, found sponsors, and presented shows to the networks as a complete package. By 1929, advertising agencies were producing 33 percent of programs; individual sponsors, another 20 percent; the networks, 28 percent; and special program builders, 19 percent. !! Within a few years, the agencies took over virtually all but the sustaining programs the networks produced for use during unsold airtime.

Radio

- Notes on Programming
  - Initially limited to the evening hours
  - By the late-1920s, broadcasters realized that the right daytime programming might attract housewives
    - Result: serial romantic dramas, such as “Ma Perkins” and “The Romance of Helen Trent”
      - Termed soap operas because these programs were most often sponsored by laundry soap manufacturers

Radio

- Notes on Programming - 2
  - By the early 1930s, morning programming focused on weather reports, recorded music, and talk a la "Don McNeill's Breakfast Club"
  - By 1930, evening programming focused on the radio genres with mass appeal
    - Domestic sitcoms
    - Crime, mystery, & detective shows
    - Comedy/Variety shows
    - Radio versions of plays and movies

Domestic sitcoms – These combined comedy and drama, often in the form of a husband-and-wife sitcom. This genre included *Vic and Sade, The Aldrich Family, Fibber McGee and Molly, The Life of Riley, the Bickersons, The Great Gildersleeve,* and *The George Burns and Gracie Allen Show*

Crime-mystery-detective shows – These included *Mr. District Attorney; Mr. Keen, Tracer of Lost Persons; The Shadow; The Fat Man; The FBI in Peace and War; Candy Matson; Yours Truly, Johnny Dollar; The Adventures of Philip Marlowe; Richard Diamond*; and *The Adventures of Ellery Queen*

Comedy/Variety shows - comedy/variety shows included *The Jack Benny Program, The Edgar Bergen and Charlie McCarthy Show, Burns and Allen, The Fred Allen Show, The Bing Crosby Show,* and *The Bob Hope Show*

Radio Versions of Plays & Movies – Radio versions of films were done by *The Lux Radio Theater.* Radio versions of plays and novels were done by Orson Welles' *Mercury Theater of the Air*, and *The Hollywood Playhouse.*

Radio

- Notes on programming – 3
  - By the late 1930s, most of the programs that would occupy the top broadcast ratings slots until television (i.e. the next ten years) had made their debut on the air.
  - Only in the mid-1930s did radio networks begin to broadcast regular news programs
    - Prior to that, radio lacked the resources and incentive to gather news on its own
    - Rising international tensions made news programs popular
      - What Saddam Hussein did for CNN during the Gulf War, Adolf Hitler did for NBC and CBS News

Radio

- Radio quickly penetrated the American market
  - 1927 – 25% of all American households had a radio
  - 1929 - 1/3rd owned a radio
  - 1934 - 60% of all homes had a radio;
  - 1939 - 86% of all households owned at least one set. There were also 6.5 million radios in automobiles.

Radio

- Notes About the Radio Medium
  - With radio, the speaker addressed an audience that was invisible and unknown
  - Radio allowed millions to hear the same program at the same time
    - It provided a speaker with an audience that dwarfed any audience that could fit in an auditorium or theater
    - Along with the phonograph, it gave any song, symphony, or opera more listeners than every heard the work in a theater or symphony hall

Audience – With radio, the audience was invisible and unknown. The speaker or performer could not see facial responses or hear laughter, booing, or silence; nor was there applause. At the same time that the size of the speaker's audience had multiplied beyond anyone's calculation, his visual relationship with that audience was severed

Radio

- Notes About the Radio Medium
  - Radio leads people to create images in their mind to provide a picture background for the actions and dialog that they are hearing in the broadcast
  - Radio is a medium that allows people to do other things while they are listening
  - Radio fostered the creation of "imagined communities" of people who never met but of which we were a part – E.g. sports fans, Fred Allen fans, rock 'n' rollers, ham operators, Dittoheads

Radio imagery - There are compelling physiological reasons why people are so nostalgic for radio. "People loved radio -- and still do -- because as cognitive psychologists have shown, humans find it useful -- in fact, highly pleasurable -- to use our brains to create our own images. What we call our imagination is something the brain likes to feed by generating images almost constantly: that's what imagination is, the internal production of pictures, of images. Autobiographical accounts from great conceptual scientists like Michael Faraday, James Clerk Maxwell, or Albert Einstein describe a process in which they did their most creative work using visual imagery, which was later translated into equations and theorems" Dr Mark Tramo, a Harvard Medical School neurobiologist, emphasizes that when information comes solely through our auditory system, our mental imaging systems have freewheeling authority to generate whatever visuals they want. Anyone who has camped out in the woods at night, associating different night noises, with all kinds of soothing and dangerous possibilities, knows the power of sound. When sound is our only source of information, our imaginations milk it for all it's worth, creating detailed tableaux that images, of course, preempt.

Radio – a multi-tasking medium – With radio, you could do something else while listening, you didn't have to watch and you didn't have to concentrate, depending on what was on. Radio could adjust much more to physical circumstances -- cooking dinner, driving to work -- than any of the other media. We could 'continue with our lives' while listening. This meant that radio listening also became interwoven with the ritualized routines of everyday life -- reading the paper, eating meals.

Imagined communities – The concept of "imagined communities" derived from Benedict Anderson who asked how nationalism -- the notion of a country with a distinct identity, interests, and borders to which one belonged -- came to emerge so concretely by the end of the 18th century. He insisted that while political states had borders, leaders, and populations, nationality and nations are *imagined*, because most of the nation's members will never actually meet another, 'yet in the mind of each lives the image of their communion' -- a communion that transcends divisions based on class, race, and gender and which has both historical continuity and a future directed toward the realization of some larger, grander purpose. While Anderson saw nationally distributed newspapers and

Radio

- Notes About the Radio Medium
  - Before television, radio was a centralizing medium because of both its expense and its broadcasting nature
  - After television, radio became:
    - A narrowcasting medium that appealed to specific niches of listeners through specific types of content – specific forms of music, all news, conservative talk shows, etc., and/or
    - Audio wallpaper that served as background while doing other things at home or in the car

Audio wallpaper - TV replaced radio as the box families gathered around in their living rooms. As a result of TV, radio adopted shorter programming formats and became the background music and chat while people ride in cars or do other things at home — "audio wallpaper," as Paul Saffo, a technology forecaster in Silicon Valley, puts it

Radio

- Additional Notes About the Impact of TV:
  - Radio networks broke down and local stations found themselves on their own
    - Rise of music format stations with disc jockeys
    - Later AM radio became dominated by all news and talk/call-in shows as music migrated to FM
  - Decline of advertising on radio
    - From a high of $133 million in 1948, advertising time sales on network radio dropped to $35 million in 1960.

As radio waned as a national medium, networks broke down and local stations found themselves increasingly on their own. The rise of 'music format' radio made use of the newly 'discovered' FM band to encourage a new local approach to radio. As the disc jockey, previously featured in some local morning and late nighttime slots, slowly took over the entire radio schedule and network-distributed programs declined to virtually zero, in many cities a new 'black format' arose, pioneered in Chicago by Jack L. Cooper, and directed at black audiences. By 1948, Cooper was a successful radio entrepreneur with more than 40 hours of programs airing on four Chicago radio stations, grossing more than $185,000 annually.

Radio

- FM Radio
  - In 1933, Edwin Armstrong patented Frequency Modulation radio
    - Superior to AM since it eliminated static, provided a wider range of sound, and used spectrum more efficiently
  - FM did not take off until the late-1960s due largely to opposition from RCA
    - RCA saw FM as a rival to television for investment capital and available spectrum
    - FM threatened to undermine the position of its NBC subsidiary

Superiority of FM - FM sounds better than AM in part because it's in a portion of the spectrum less prone to natural interference, and because its channel width is 200 kilohertz -- twenty times the 10-kilohertz channel width of AM (of which only 5-kH actually contains information). Thus, FM has a rich sound modulation that AM simply can't achieve. FM, because it operates at higher frequencies than AM, is also slightly better at penetrating solids, like buildings.

Delayed takeoff of FM - There were two reasons for this. First, David Sarnoff, RCA president, saw television as the future and regarded FM as a rival for available spectrum as well as investment capital. Second, far from promising to improve RCA's profits, FM threatened to make many RCA patents obsolete and to undermine the position of its NBC subsidiary as the dominant radio network. Armstrong believed the long-delayed development of FM was the result of a conspiracy between big business and bureaucracy, but the chief reasons for FM's delayed success were the twin difficulties of introducing an alternative radio technology when AM was already well-entrenched and of obtaining spectrum and investment capital at the same time as television. *It was not really until the development of high-fidelity and later stereophonic music recording that FM began to come into its own since FM but not AM had the capability to broadcast high fidelity and stereophonic music.*

Radio

- FM Radio
  - After the mid-1960s, FM radio took off. There were several reasons for this:
    - FM radio offered a more lucrative investment opportunity than network-dominated TV and the overcrowded AM band
    - The arrival of stereo and high fidelity
    - Increased advertising on FM as advertisers discovered the quality of its listening demographics
    - AM-FM radio sets become commonplace
    - An FCC decision in 1964 that AM and FM stations owned by the same company could not duplicate more than 50% of their programs on both bands simultaneously

Takeoff of FM - In 1964, total net FM revenues were $19.7 million. Ten years later, the figure was $248.2 million. In 1962, there were, according to the FCC, 983 commercial FM stations on the air; by 1972, their number rose to 2,328. By 1976, there were nearly 3,700 FM stations on the air. By the 1970s, it was estimated that 95% of households had FM sets. Soon, more people were listening to FM than to AM.

Reasons for FM's takeoff - There were several reasons for this mush-rooming of FM broadcasting: (1) a better chance of success for investors than in network-dominated television and the badly overcrowded AM field; (2) an increased interest in cultural affairs and classical music; (3) the arrival of stereo and the high-fidelity industry, coinciding with this interest in better music; (4) various FCC decisions that helped give FM a separate identity from AM, its longtime subsidizer; (5) the driving away of some of the audience by the poor programming of television and AM; (6) the increasing use of FM by advertisers as the quality and quantity of its audience became known; and (7) the growing sales of FM sets, from 2 million a year in 1960 to 21 million in 1968. By the 1970s combined AM-FM sets were commonplace.

Non-duplication - Since the late 1940s many FM outlets owned by AM stations simply broadcast the same programming their AM parents did. But by the early 1960s FCC Commissioners Robert E. Lee and Kenneth Cox argued that frequencies had become so scarce in the face of increasing demand that duplication was "a luxury we can't afford." In 1962 the FCC had ordered a freeze on AM license applications while it tried to address the overcrowding in the spectrum. The solution it chose was to promote more aggressive commercial exploitation of the FM band. In May of 1964 the commission issued its non-duplication ruling, which was to take effect in January 1967. In cities of more than 100,000 people, radio stations with both AM and FM could not duplicate more than 50 percent of their programming on both bands simultaneously. Although the edict affected only 337 of the country's 1,560 commercial FM stations (and of these, 137 had already been programming separately), it nonetheless helped promote much more enterprising exploitation of the medium. Between 1964 and 1967, 500 new commercial FM stations and 60 educational stations took to the air

Radio

- Some Effects of the Radio
  - By broadcasting the same content to a vast audience at the same time for all, radio created a shared simultaneity and unity of experience
    - This led to both a standardization of culture and also of speech
  - It led people to focus on and become knowledgeable about what was happening at the national and international level as distinct from the local community level
    - Thanks to radio and later TV, we now have people who are well-informed about what is going on in Washington or in the Middle East, but who have no idea of who their local mayor or city council representative is

Standardization of Speech – Fully established networks and the advertisers who controlled much of the radio programming imposed standards of radio pronunciation. Diction contests set norms for announcers and listeners. Thus, announcers, newscasters, dramatic actors/actresses, and those who read the commercials spoke an 'official' English that was largely mid-Western in form.

Radio

- Some Effects of the Radio
  - Fostered the growth of several major corporations – RCA, NBC, CBS, ABC, Mutual, GE, Lonsdale Tube, Motorola
  - Created several new occupations
    - Electronics engineer
    - Radio repairmen
    - Radio announcers & actors
    - Sound effects men
    - Radio script writers

Radio

- Some Effects of the Radio
  - Enabled Government leaders to speak to whole populations thus going over the head of local elites, existing bureaucracies, local political machines, and print media barons
    - This greatly increased the power of national government leaders vis-à-vis local leaders

Radio

- Some Effects of the Radio
  - Along with the movies, led to the rise of a popular entertainment industry geared to the mass market
    - Reduced traditional forms of high art to elite ghettos of the well-to-do and the highly educated
    - Created a uniform mass popular culture
  - Radio made music a more integral, structuring part of everyday life and individual identity.
    - Fostered an interest in classical music – especially live performance due to the poor sound quality of early radio

Radio – Radio led to the rise of a revolutionary popular entertainment industry geared to the mass market which reduced traditional forms of high art to elite ghettoes inhabited by the well-to-do and the highly educated. Thus, the attendees of the theater and the opera, the visitors to the museums and the art galleries, and the readers of poetry and literary classics were increasingly among the educated elites while the common culture was based upon the mass entertainment industries -- cinema, radio, television, and pop music -- which the elite shared while the general public rarely encountered the traditional high arts
Uniform mass culture – Thanks to broadcast radio, people all over the country listened to Edward R. Murrow's news reports, Amos 'n' Andy, The Shadow, The Lone Ranger, and Benny Goodman's music
Music – Prior to the radio and the phonograph, people heard music only when in the presence of musicians. Now they could hear music whenever they wanted – by either putting a record on the phonograph, or tuning into the proper radio station. From the outset, music filled much of radio's available broadcast time. Live performances of the parlor piano and vocal music of recent decades were most common at first, but classical music, especially opera and orchestral performances, enjoyed frequent broadcast. While many Americans had joined in or at least heard the more popular music at home, in saloons and vaudeville theaters, or elsewhere, few had attended an opera or symphony concert. ***The audience that heard classical music with the low sound quality of early radio was soon eager for live performance. Between 1928 and 1939 the number of major professional symphony orchestras increased from 10 to 17; the total number of orchestras, including part-time less professional ones in smaller cities, grew from 60 to 286***. Perhaps !! more significant, whereas musical instruction in public schools was almost unheard of in 1920, two decades later it was widespread. Thirty thousand school orchestras and 20,000 bands had sprung up. Radio was much more effective than the earlier technological in-novation, the phonograph, in building an audience for classical music. Until the long-playing record was developed in 1948, phonograph records could

Radio

- Some Effects of the Radio
  - Along with the movies,
    - it reinforced ethnic and racial stereotypes
      - Italians were gangsters or immigrants (Life with Luigi)
      - Blacks were illiterate and stupid (Amos 'n' Andy)
      - Canadians were Royal Mounted Policemen (Sgt Preston and the Yukon)
    - It popularized various myths
      - Western cowboy, lawman, and outlaw
      - Hard-boiled cynical detective
      - The world as a battleground of "good" vs "evil" with "good" always winning out in the end

Radio

- Some Effects of the Radio
  - The concept of the audience led to the concept of the average American
    - This provoked an interest in ratings, audience demographics, and the tastes and attitudes of the presumed average America
      - What was the average American listening to? Or buying? Who was listening to *Our Miss Brooks* or *The Shadow*?
  - Radio adversely affected the advertising revenues of newspapers and magazines

Audience - The object of this scrutiny—the audience—was itself an invention, a construction that corralled a nation of individual listeners into a sometimes monolithic group that somehow knew what "it" wanted from broadcasting. But the most important thing to remember is something we now take totally for granted: how the audience spent its leisure time was up for study and study, in fact, became a hugely profitable industry. Beginning in the 1920s and continuing to today, the corporate obsession with the tastes and preferences of the broadcast audience has produced a nationwide, technologically instantaneous network of audience surveillance. Audience ratings got their start when Archibald Crossley developed a ratings service that relied on telephoning people and asking them what they had listened to the night before

Print advertising – Advertisers preferred radio over print media for the following reasons:

1. Like graphics, but unlike the printed word, radio could influence illiterates
2. Unlike newspaper and magazine ads, radio commercials could not be skipped over.
3. “Not only could one listen to radio while engaged in other activities, including reading, one could continue to listen long after becoming too tired to do anything else.”
4. Unlike print communication, radio could be received by groups of people -- a family in a living room, friends riding in a car,
5. Because radio carried the human voice, broadcasting seemed more personal and more intimate than print, and thus was more persuasive than print.

Radio

- Some Effects of the Radio
  - The technical limitations of early radio:
    - Precluded use of very high or very low frequency musical instruments – cello, oboe, violin
    - Favored use of certain musical instruments - piano, clarinet, and saxophone
    - Led to the use of crooning as a singing technique
    - Favored broadcasting of jazz despite its frequent association with prohibition-era speakeasies and its black roots

Crooning - *The limitations of radio, however, reshaped music.* ***Intense voices, especially high sopranos, had a tendency to blow out the tubes on radio transmitters. As a result, a number of singers developed a new soft, gentle style that came across well and soon became known as "crooning."*** Crooning was pioneered by Vaughn de Leith, "The First Lady of Radio' who performed frequently on WJZ in Newark in the early 1920s. De Leith developed a soft, cooing approach to her singing that was less stage oriented and more intimate, and that didn't do violence to transmitters.[14] This style was emulated with great success by other singers, most notably Rudy Vallee, Kate Smith, and Bing Crosby, who built large and loyal audiences as they perfected the 'crooning' style.

Jazz - Radio did not at first embrace jazz, a musical genre ripening rap-idly in the 1920s. Jazz had its origins in Dixieland, ragtime, blues, and other musical forms that had evolved in the pre-World War I urban South, particularly in the black community of New Orleans. | Jazz migrated along with its practitioners to Chicago and elsewhere during the war and enjoyed growing popularity throughout the ur-ban North in the 1920s. Since jazz was not considered altogether re-spectable, whether because of its black roots, its spontaneous,!! improvisational nature, its pulsating and often passionate style, or its frequent association with prohibition-era speakeasies, most radio stations were at first reluctant to broadcast it. Band leader Paul Whitman did a lot to change attitudes toward jazz, less because he was a classical-trained musician and actually wrote down parts for his musicians than because he favored a soft, sweet, and smooth style of jazz. When he commissioned composer George Gershwin to write a jazz composition for piano and orches-tra and first presented *Rhapsody in Blue* in February 1924, jazz ac-quired instant respectability. Whitman's orchestra and his style of jazz became a regular feature of radio music for the next quarter-century. Other bands led by Guy Lombardo, Ozzie Nelson, Rudy Vallee, Duke Ellington, Glenn Miller, and Tommy and Jimmy Dorsey followed in Whitman's path, helping to make jazz an impor-tant part of radio broadcasting, especially in the 1930s and 1940s.

Radio

- Some Effects of the Radio
  - Fostered the evolution and popularization of country music
  - Radio and WWI led to code encryption and code breaking
  - Radio paved the way for radar, TV, homing devices, and cellular telephony
  - Radio made music an acceptable endeavor for men
  - Radio led people to match their personal schedules to the schedules of the broadcast day

Country music - Country music in the 1920s consisted of a range of non-professionalized, traditional folk music often referred to as "hill-billy." Early Southern radio stations experimented successfully with fiddle tunes, gospel songs, and other localized forms of folk music. In April 1924 the Sears, Roebuck station in Chicago (named WLS for World's Largest Store) began a fiddle and square dance music program called "The National Barn Dance." It was an instant hit. Nineteen months later, station WSM in Nashville, Tennessee, fol-lowed with a variety show named "The Grand Old Opry." Before long, the "Opry" had proved so popular that it was being broadcast four hours a night every Friday and Saturday. These programs, which could be heard throughout the South and Midwest, and a number of imitators called attention to country music and made celebrities of its best performers. Innovations in style, such as the combining of fiddle, guitar, mandolin, and banjo to make "bluegrass music," soon followed. Radio lifted country music from its highly localized roots and encouraged its evolution as widely popular and distinctive American music

Code encryption - Radio was an awkward instrument of war since radio messages could be heard by anyone listening in. This led governments to begin encrypting radio transmissions in code and subsequent attempts on the part of rival governments to break the codes. Thus, radio made code encryption and code breaking key elements of intelligence in war and diplomacy.

Set the stage for TV - Radio is arguably the most important electronic invention of the century. Cognitively, it revolutionized the perceptual habits of the nation. Technically, culturally, and economically, it set the stage for television. It forever blurred the boundaries between the private domestic sphere and public, commercial, and political life. It made listening to music a daily requirement for millions of Americans. For the entire span of the twentieth century, listening to radio— first introduced to America as "wireless telegraphy" in 1899—has been a major cultural pastime. Even with the advent of television, which was supposed to make radio obsolete, radio has remained a thriving cultural and political force. Today we have twice as many radios in America as we do people.

Men and Music – As Susan Douglas in *Listening . Radio and the American Imagination* noted, “radio—by making musical pleasure acceptable for men; by producing a fraternal

Phonograph

- Before the Phonograph, the piano
  - 1855 – The Steinway cast-iron frame piano
  - 1890s – Mass production and the upright made the piano generally affordable to the middle class
    - 1890 – 32,000 pianos produced
    - 1914 – 374,000 pianos produced
    - By 1920, about 25% of American homes had a piano
  - 1900s – Player piano

Steinway - In 1855, a German-born American piano maker named Henry Steinway began to manufacture a piano with a cast-iron frame that gave its sound much greater brilliance and power than earlier forms. There have been no fundamental changes in the design and construction of pianos since 1855. This improvement prompted widespread interest in pianos and musical compositions for it.

Mass production of pianos - By the 1890s, mass production and coming of the upright piano [*A piano having the strings mounted vertically in a rectangular case with the keyboard at a right angle to the case*], made the piano generally affordable to the middle class, so much so that c1900, there were an estimated one million pianos in use in American homes

Player piano - In 1896, Jacquard's concept of the punch card was applied to the piano to produce the player piano. Nearly every celebrated pianist of the time was recorded on the system Player pianos, which played music using perforated paper rolls to play specific songs were popular in the early-20th Century.

Phonograph

- Invention of the Phonograph
  - Edison invented the phonograph because of concern that the high cost of telephones would limit their use
    - Edison had two concepts as to how the phonograph would be used
      - A person would record a spoken message and then take the record to a central station which it could be transmitted to an addressee over a telephone
      - A businessman would use it as either a dictating device to a secretary or as a device to record his phone conversations

Phonograph

- Phonograph Developments
  - Mid-1880s – The flat master disc of Emile Berliner replaces the Edison wax cylinder
    - Simplified both the recording and reproduction process
  - Edison subsidiary develops the jukebox
    - Widely installed in neighborhood soda fountains and saloons
  - 1906 – the Victor Talking Machine Company creates the Victrola – a phonograph that is also a piece of stylish furniture

By the mid-1880s, others moved into the business with new patents (using wax cylinders and an improved stylus) and new names. Competing with Edison's cylinder machines were gramophone machines developed by Emile Berliner, a German immigrant, who developed a flat master disc from which thousands of duplicates could be made, thus simplifying both the recording and the reproduction processes. An Edison subsidiary developed phonographs for public nickel-in-the-slot operations that played musical selections. Such prototype jukeboxes were soon installed in neighborhood soda fountains and saloons The Victor Talking Machine Company, which promoted the iconic commercial image of a small dog listening to "His Master's Voice" – !! in 1906 transformed the phonograph into a piece of stylish furniture. The new phonograph was a 4'-high console, made of mahogany, with the horn enclosed in the cabinet and a lid keeping the turntable and tone arm out of sight. By 1914, Americans had bought more than 500,000 phonographs annually.

Phonograph

- Phonograph Developments
  - Mid-1920s – Electrical recording using microphones and acetate records replaces acoustic recording
  - Radio initially has a depressing impact on phonograph sales but later serves to popularize records sales
    - Quality of radio music was superior to that of phonograph music
    - 78 rpm records could contain only 4 minutes of music

Acoustic recording - Until the mid-1920s, when electrical recording, which used microphones and acetate masters, became the standard, recording was done by the 'acoustic' method. Performers sang or played into a tin horn connected to a hose, which was in turn connected to a needle. The needle turned these sonic impulses into grooves on a wax disk. The process turned high and low notes into noise, and percussive sounds from drums, pianos, or musicians tapping their feet knocked the needle off the wax.
Radio - Radio stations, of course, had started out in the 1920s by relying heavily on phonograph music, but that had changed with the rise of the networks, which showcased live music, largely to avoid copyright infringement suits from composers and record companies. The crash of 1929 nearly destroyed the phonograph industry as people turned to radio as their main source of music. But by the late 1930s a renewed symbiotic relationship began between the two industries, especially when the country's 162 non-network stations (almost one-quarter of all AM stations in the country) were exempted from the deal struck between the American Federation of Musicians and the networks that restricted the use of mechanically reproduced music on the air. These smaller stations became outlets for the 400 new recording companies started during the 1940s. Now local stations could produce regional, even national hits, and new ties—which were later to become problematic—developed between record company representatives and DJs. They also promoted and popularized new musical genres, such as rock 'n' roll.

Phonograph

- Phonograph Developments
  - 1948 - The 33-1/3 long-playing record (LP) and 45-rpm single were introduced
    - Unlike the earlier 78 format, these were vinyl rather than glass or metal coated with shellac
    - This paved the way for both high fidelity recordings and
  - 1950s – High Fidelity recordings
    - Created the audiophile
  - 1958 - The first stereophonic phonograph discs made available to the general public in 1958.
  - 1961 - The FCC announces stereo FM technical standards

The "battle of the speeds between Columbia Records, which in 1948 had introduced its more expensive 33 1/3 rpm long-playing album, and RCA Victor's much cheaper 45 rpm singles format, inadvertently also pitched the adult against the youth market. !! The cheaper records -- which could be played on a small box phonograph that sold for $12.95 -- were simply more affordable to kids on allowances, and they allowed the kid to sample a variety of musical styles, especially early rock ‘n’
ro ll.

High fidelity - The hi-fi craze of the late 1940s and 1950s had been started by tinkerers dissatisfied with the sound quality available in commercially manufactured phonographs. They began assembling their own "rigs" out of separate compo-nents, paying special attention to and customizing the wiring that connected the parts into a whole. The proper matching and balancing of components was critical to success. The goal was to reproduce in one's living room the way clas-sical music sounded in a concert hall. The most sensitive human ear can hear sounds ranging from 20 to 20,000 cycles per second. Most old 78 rpm records could play up to only 7,500 cps, and AM radio could reach a maximum of 10,000 but usually broadcast at 5,000 cps. Audiophiles wanted to push beyond these ranges, which cut off the highs as well as the lows of most music. "Hi-fi is, in fact, an attitude," reported *Time,* "a kind of passion to reproduce music exactly as it sounded in its natural setting.“

Stereo - Stereophonic sound is the reproduction of sound, using two or more independent audio channels, through a symmetrical configuration of loudspeakers, in such a way as to create a pleasant and natural impression of sound heard from various directions, as in natural hearing.

Phonograph

- Phonograph Developments
  - 1961 - Licensed regular stereophonic FM radio broadcasting begins
  - 1960s – Dolby stereo recording
  - 1963 – Introduction of the audio cassette
  - 1971 – Quadraphonic sound
    - Led the way to the surround sound systems of today
  - 1982 – Dolby surround sound
  - 1985 – "Yellow Book" standard for CD-ROMs published
    - Meant that CD-ROMs could hold either music or data

Audio cassette - Between the early 1970s and late 1990s, the cassette was one of the two most common formats for prerecorded music, first alongside the LP and later the Compact Disc.[2] *Cassette* is a French word meaning "little box." Compact Cassettes consist of two miniature spools, between which a magnetically coated plastic tape is passed and wound. These spools and their attendant parts are held inside a protective plastic shell. Two stereo pairs of tracks (four total) or two monaural audio tracks are available on the tape; one stereo pair or one monophonic track is played or recorded when the tape is moving in one direction and the second pair when moving in the other direction. This reversal is achieved either by manually flipping the cassette or by having the machine itself change the direction of tape movement ("auto-reverse").[3]

Quadraphonic sound - The development of quadraphonic records was announced in 1971. These recorded four separate sound signals. This was achieved on the two stereo channels by electronic *matrixing*, where the additional channels were combined into the main signal. When the records were played, phase-detection circuits in the amplifiers were able to decode the signals into four separate channels. There were two main systems of matrixed quadrophonic records produced, confusingly named SQ (by CBS) and QS (by Sansui). They proved commercially unsuccessful, but were an important precursor to later 'surround sound' systems, as seen in SACD and home cinema today.

Dolby Surround Sound - Dolby Surround was the earliest consumer version of Dolby's multichannel analog film sound decoding format Dolby Stereo. introduced to the public in 1982 during the time home video recording formats (such as Betamax and VHS) were earlier introducing Stereo and HiFi capability.The term Dolby Surround is used as not to confuse theater stereo which is at least four channels of audio with home stereo which is two. Dolby Surround is the earliest domestic version of theatrical Dolby Stereo. In the consumer surround sound,, four channels of audio information — left, center, right, and mono surround — are matrix-encoded onto two audio tracks. The stereo information is then carried on stereo sources such as videotapes, CDs, DVDs, and television broadcasts from which the surround information can be decoded by a processor to recreate the original four-channel surround sound. Without the decoder, the information still plays in standard stereo or monaural.

Phonograph

- Impact of the Phonograph
  - Along with radio, made music an major part of people's lives
    - Before the phonograph (and radio), hearing music required the presence of musicians, singers, or a player piano
    - Made listening to music a passive experience
  - Provided much of the broadcasting content for both early radio and current FM radio
  - Fostered the development of FM radio

Phonograph

- Impact of the Phonograph
  - Gave rise to the juke-box (and the teenage hangout)
  - Fostered the development of portable music media
    - The record gave way to the 8-track, then the audio cassette, and finally the CD-ROM and iPod.
  - Provided through the sale of records (and related media) a major source of income for musicians, singers, opera companies, choruses, and others involved with music

Phonograph

- Impact of the Phonograph
  - In the form of the audio cassette and its related player-recorder
    - It gave Third World peoples a relatively cheap and easy technology by which they could make audiotapes of whatever they wanted to hear -- their native music, stories, myths, chants, prayers, sermons, and speeches. Their impact has frequently been revolutionary.
    - It permitted the survival and even the renaissance of many forms of local music and stories that were in danger of dying out
    - It facilitated the cross-cultural dissemination of musical forms and styles

Third World effects - "The Islamic revolution of Iran in 1978 and 1979 was probably the first revolution of the world conducted primarily through the cassette recorder. For many years before the revolution, the Ayatollah Khomeini and other exiled religious leaders recorded sermons of revolution in Paris and then distributed them throughout Iran. Each tape player is also a recorder, so that each owner can make new copies as well as play the old ones. In this way the anti-Shah and anti-Western message of the casette spread throughout Iran from one backwater village to another. Even those beyond the reach of the government-controlled radio found easy access to the ideas of the Ayatollah in France."

Television

- Television is based on the discovery of photosensitivity in 1873
  - When certain metals (like selenium) are exposed to bright light, they emit an electrical current
  - This led to the concept of converting an optical image to an electric current and then converting the current back to an image
  - This led eventually to television, the wire photo, and the fax machine

Photosensitivity – The concept of photosensitivity was based on the discovery that certain metal (like selenium) when exposed to bright light gave off an electrical current. This led to the idea of converting an optical image to a matching electrical pattern at a transmitting site and then converting the pattern at a receiving site back to an optical image.

Television

- Early History
  - 1875 - George R. Carey of Boston proposed the use of two matching banks of light-sensitive cells connected by a cable that had a separate transmission circuit for each picture element
  - 1881 – Sheldon Bidwell described a facsimile scanner that moved a selenium element over an image area
  - 1884 – Dr Paul Nipkow patented a scanner that rotated a disc bearing a spiral of small apertures over the image to be scanned

Television

- Early History – 2
  - Two crucial discoveries
    - Cathode rays or beams of electrons – discovered by Sir William Crookes in 1878
    - Thermionic emission (the Edison Effect) was identified as the cause of the blackening of incandescent light bulbs in 1883
  - 1892 – Elster and Geitel devise the photoelectric cell

Edison had over a thousand patents, but made only one scientific discovery – the Edison Effect. This effect was to be a key concept behind many future innovations in electronics, but Edison, himself, did not see the technological possibilities or consequences inherent in his discovery. One use of the Edison Effect was in the Fleming valve of 1904 to detect wireless radio signals.

Television

- Early History - 3
  - 1897 – Karl F. Braun creates a tube that focuses and deflects Crookes' cathode rays
    - This was the basis of both the television picture tube and the modern cathode ray oscilloscope.
  - 1906 – Max Dieckmann and G. Glage, using Braun's tube, devise a facsimile system
  - 1906 – Lee De Forest invents the 3-element audion tube
    - This permits amplification not only of voice signals but also of the weak signals obtainable from image scanning systems

Television

- Early History - 4
  - December 29, 1923 – Vladimir Zworykin filed for a patent for an all-electronic television system employing an electronically scanned camera pickup tube and a cathode ray display tube
  - 1925 – John Logie Baird and C. Francis Jenkins succeeded in transmitting silhouette still picture images via radio
  - January 13, 1926 – Baird succeeds in transmitting moving images in which the gradations in tone scale make it possible to recognize facial features and expressions

Zworykin & CRT - Both Vladimir Zworykin and Philo T. Farnsworth believed that a cathode ray tube (CRT) -- a tube with an emitter filament at one end and the other end painted with a fluorescent chemical -- could, when a current is applied to the filament, display on the fluorescent surface of the tube the pattern made by a stream of electrons. Both also believed that if that pattern could be controlled -- could be made to correspond to a generating image -- a transmitting CRT could translate photographs into electricity and a receiving CRT could convert the electrical signal back into an image.
Baird - Baird's system was a mechanical-electronic system that used a mechanical scanner; Zworykin's was all electronic system. By 1929, Zworykin had improved his system to the point where he was able to impress the Institute of Radio Engineers that his system was workable.

Television

- Early History – 5
  - 1927 – Dr Ernst Alexanderson at GE begins experimental television transmissions over W2XAD in Schenectady, NY
  - 1934 – NBC began transmitting electronically scanned 343-line 30 frame/sec interlaced TV
  - September 10, 1938 – The RMA Standards Committee submits its proposed standards to the FCC

Two things that hampered the development of television in the 1920s and 1930s were 1) the existence of incompatible mechanical-electrical television and electronic television systems; and 2) the absence of either government or industry transmission standards. By 1933, it was evident that all electronic television systems offered picture quality superior to that of mechanical-electrical systems. Each experimental television station, however, was free to choose its own standards. By 1935, it was clear that uniform transmission standards were essential if the development of television were to proceed. If receivers for the general public were to be produced, they must match the characteristics used in the transmission system and all transmissions must be compatible. This led the Radio Manufacturers' Association (RMA) to set up a standards committee to develop a set of transmission standards and to win approval of those standards from the radio industry.

Television

- Early History – 6
  - The FCC, however, delayed approval of the proposed RMA standards
    - Dumont & Philco did not agree with them
    - CBS was working on a mechanical-electrical color TV system (which was incompatible with the RMA system) and wanted color taken into account
    - FCC felt that premature approval of standards would discourage R & D and thereby forestall the development of higher technical standards

FCC - The FCC's concern about technical standards was justified on two counts. First, their refusal to approve the initial proposed standards resulted in eventual development of those proposed by the National Television Systems Committee (NTSC), a committee of 168 specialists from the entire radio-television industry which resulted in picture quality superior to that of initial RMA-proposed standards. Second, the fact that the FCC approved the proposed NTSC standards in 1941 (and later declared that any color television transmission system must be compatible with existing black & white television) meant that U.S. television would have technical standards and TV picture quality that was lower than the European PAL and SECAM standards that were developed later. But the fact that the FCC and the television industry could not agree on standards until 1941 meant that Germany (where television was under the control of the government) was able to begin experimental television broadcasting in March 1935 and in 1936 distributed television broadcasts of the 1936 Olympics to selected sites in the German capital. In the late-1930s, the BBC began regular television broadcasts.

Color – On August 28, 1940, CBS made the first experimental broadcast of high definition color pictures transmitted from motion picture film using a mechanical field-sequential color system developed by a CBS team led by Dr Peter C. Goldmark. Live studio broadcasts followed on December 2, 1940.

Television

- Early History - 7
  - 1938 – To force FCC action, RCA announced that it would start regular TV broadcasts using the 441-line scanning standard
  - April 30, 1939 – RCA begins daily broadcasting
    - The initial broadcast featured the speech of President Franklin D. Roosevelt as he opened the 1939 New York World's Fair
  - May 1940 – An FCC report stated that when the radio-television engineers agreed on a standard, the FCC would authorize full commercial broadcasts
    - This led the RMA to establish the National Technical Standards Committee (NTSC) on July 31, 1940

Television

- Early History – 8
  - March 8, 1941 – The NTSC and the television industry approve of set of 22 standards that cover all technical phases of black & white television
    - This included increasing the number of scan lines from 441 to 525
  - May 1941 – The FCC approves and adopts the NTSC standards and authorized the transmission of commercial television programs, starting on and after July 1, 1941

Television

- Impact of World War II
  - Shut down television broadcasting and production of television sets
  - Diverted engineering talent and resources into radar, VHF-UHF-microwave band transmissions, ordnance direction, and scanning technology
    - Out of this came the image orthicon camera which produced a much sharper TV image with greater depth of field than the iconoscope

As of the start of U.S. involvement in WWII in 194 and the end of the war in 1945, there were fewer than 7,000 TV sets in the whole U.S. and only 9 TV broadcasting stations – 3 in New York City, 2 in Chicago, 2 in Hollywood, 1 in Philadelphia, and 1 in Schenectady NY.

Television – Homes with Sets

Year	1948	1950	1952	1955	1956	1960	1965
% Homes with sets	3%	10%	34%	67%	81%	87%	94%

Data from http://www.tvhistory.tv/Annual_TV_Households_50_78.jpg

Television

- Network TV Production
  - Demand for programming led the networks into TV production
    - All three networks set up television production studios first in New York City and then in Hollywood
      - 1949 – ABC purchased the old Vitagraph studio property in Hollywood and converted it to TV production
      - 1952 – CBS inaugurated program service from CBS Television City in Hollywood
      - 1952 – NBC started operations at NBC Television Center in Burbank CA

Television

- Independent TV Production
  - As noted in the discussion of the movies, the Studios initially saw television as a mortal threat, but independent movie producers saw TV as an opportunity
  - The independents began making films – mostly crime dramas, westerns, and comedies – for television
  - Among the most successful was Desilu Productions
    - The success of Disneyland with the theme park, TV programs, and movies mutually promoting each other led studios to see television as a potential ally

Independents – The independents realized that *filmed drama could earn for its producers more money than live programming ever could. Under a practice known as syndication, a producer would sell rerun rights to the network and to groups of local stations*." From the late 1940s on, independent producers began setting up shop on lower Sunset Boulevard in Hollywood and started cranking out cut-rate price films (mostly crime dramas & westerns) for television***. Tempted by the huge profits that could be made, many Hollywood producers made the switch to independent television production. Among them were two former RKO contract players -- Lucille Ball and Desi Arnaz -- who formed Desilu Productions***. By 1955, they were turning out hundreds of hours of programming every year, including *I Love Lucy.*

Television

- Color Television
  - In the late 1940s, CBS developed a 405 scan line 24 fps color system that could be transmitted in the established 6-MHz television channel
  - In 1949, CBS petitioned the FCC to establish standards for color television
    - At this time, there were 3 competing systems
      - CBS – Field sequential system
      - RCA – Dot sequential system
      - Color Television, Inc – Line sequential system

Television

- Color Television - 2
  - October 10, 1950 – the FCC found in favor of the CBS system
    - This led to a long court fight with RCA, but the Supreme Court in May 1951 decided in favor of CBS
  - June 25, 1951 – CBS began color TV broadcasting
    - Problem was that the CBS color system was incompatible with the NTSC black & white system
    - On October 22, 1951, manufacture of TV sets capable of receiving CBS color broadcasts was halted at the request of the Office of Defense Mobilization.

I.e. None of the millions of existing black & white TV sets could receive the CBS color telecasts, nor could set capable of receiving the CBS color broadcasts receive any black & white NTSC television signals.

Television

- Color Television – 3
  - 1950 - The disputes over color television led the television industry to form a second NTSC to devise a color TV system that would be compatible with the existing black & white NTSC system and acceptable to the industry
  - July 21, 1953 – The NTSC presented its proposals to the FCC
  - December 17, 1953 – The FCC approved the NTSC proposals, reversed its previous approval of the CBS system, and authorized color service to the public under the NTSC standards

Television

- Color Television – 3
  - January 1, 1954 – NBC began color broadcasting with the Tournament of Roses parade in Pasadena CA
  - 1954 – Networks open color TV studios, which include telecine facilities for broadcasting color movies using a 3-tube vidicon camera for scanning the film
  - 1955 – First color broadcast of the World Series

Color Television

Year	% of TV Homes with Color TV
1964	3.1%
1968	9.6%
1968	24.2%
1970	39.3%
1971	45.2%
1972	52.6%
1973	60.1%

Year	% of TV Homes with Color TV
1974	67.3%
1975	70.8%
1980	83.0%
1985	91.0%
1990	98.0%
1995	99.0%

Television

- Film, Videotape, and Television
  - Prior to 1948, almost all TV programming was either live or programs produced from motion picture film
    - Kinescopes (35mm film recordings of TV broadcasts from the face of the picture tube) were a common way of distributing and preserving programs
  - By 1956, AMPEX had developed a 2” quad videotape recorder which it exhibited to CBS executives

Television

- Film, Videotape, and Television
  - April 14, 1956 – The AMPEX videotape recorder was unveiled at the National Association of Radio and Television Broadcasters convention in Chicago
    - It was a big hit and the backlog of orders exceeded a year of production
  - Videotape was used initially for time zone delay broadcasts and then later for pre-recording of complete television programs, recording of taped inserts for programs, and production recording of commercials

What differentiated the AMPEX 2" quad system from earlier videotape recorded developed by the Bing Crosby Enterprises labs was that instead of recording video in audio-style longitudinal tracks (which required 7,000 feet reel of tape for a 15-minute recording, the AMPEX system used a single track transverse scanning across the width of the tape which was done by four recording heads mounted on a rapidly-rotating drum, each head successively scanning across the tape. This method reduced the lineal speed from the 20 ft/sec required by longitudinal recording to the 15 in/sec, so that much less videotape was required.

Television

- Film, Videotape, and Television
  - As time went on, helical scan formats were introduced – these permitted easier editing, still frame, slow motion, and reverse play. They also allowed tape size and videocamera size to decline, making the videocamera easily portable
  - Given the cost of videotape, many TV stations normally reused videotape, so that early TV programming, unless it was filmed or kinescoped, was not preserved.

Television

- Cable TV
  - Began in 1949 in Astoria OR
  - Had its origin in the fact that many communities lacked television service because they were either in or beyond the fringe reception area or signals were blocked by mountains, hills, or tall buildings
  - Cable operators soon found that they could put their own or other locally-originated programs on unused cable channels
    - This made cable and the channels they carried (like TNT and CNN) competitors to the broadcast channels

Television

- Cable TV
  - Cable operators also found that they could sell their cable services in cities by supplying ghost-free images and providing additional channels and programs
    - This led to the use of pay channels who provided closed-circuit programming of either sporting events or first-run motion pictures on either cable channels (such as HBO or Cinemax) or theater showings (as in the case of Heavyweight championship fights)

Cable Television

Year	No. Subscribers (millions)	% of TV houses
1960	0.65	1.4%
1965	1.275	2.4%
1970	2.49	7.6%
1975	3.45	15.5%
1977	12.168	16.6%
1979	14.814	19.4%
1980	17.671	22.6%
1981	23.219	28.3%
1982	29.340	35.0%

Year	No. Subscribers	% of TV houses
1983	34.113	40.5%
1984	37.290	43.7%
1985	39.872	46.2%
1987	44.970	50.5%
1988	48.636	53.8%
1989	52.564	57.1%
1990	54.871	59.0%
1995	62.956	65.7%
1999	67.592	68.0%

Television

- Notes about Television
  - TV has several genres
    - Many of these originated with radio or the movies – news, sports, adventure program, mystery-detective program, situation comedy, Western, soap opera, variety show, talk show, and game show
    - One genre originated by TV was the media event
      - Unlike other events, it is live, out-of-the-ordinary, pre-planned, organized by some public body, usually attracts a large audience, and is often ceremonial
      - The real event is the one experienced by the TV audience, not by those physically present at the event

TV genres - Producers and audiences alike routinely assume the existence of television genres. Broadcasters and TV listings in newspapers regularly classify programs by type: news, documentary, sports, action, adventure, Western, situation comedy, soap opera, variety show, game show, talk show, and children's cartoon.

Media events - Typically, media events are ceremonial events. !! In such events, the media rarely intrudes -- it interrupts only to identify the music being played or the names of the lesser participating dignitaries. The media upholds the definition of the event by the organizers, explains the meaning of the symbols used on the occasion, and only rarely intervenes with analysis and almost never with criticism. If the event originates in a particular location, that location is turned into a Hollywood set. Sometimes the original event is inaccessible to live audiences because the event is taking place far away. Some media events have no original anywhere because the broadcast is a montage originating in several different locations simultaneously. E.g. Prince Charles at the church while Lady Diana's carriage is drawn through the streets of London. Media events are not just televised events because those physically present at the site of (or one of the sites of) the media event will not see all that is seen by the television audience. T*hus, those near the Capitol steps to watch a Presidential Inauguration will not see, as television viewers do, the President-elect and outgoing President riding down Pennsylvania Avenue to the Capitol, or the new President and his family riding (or walking) from the Capital to the White House. Those at a televised NFL Football game will not see the close-up of the quarterback being sacked nor will the television audience see or hear the catcalls and comments directed by fans at the visiting team.*