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## 11

Telecommunications<sup>1</sup>

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## INTRODUCTION: REVIEWING AN EMERGING FIELD

The history of telecommunications is an emerging field of research, "discovered" in the last twenty years mainly by scholars of politics, economy, technology, and media. Several elements have contributed to increase scientific interest in telecommunications and, consequently, on their histories: the multi-facing and global growth of telecommunications and their significance for the entire economy in the 1980s (Saunders, Warford, and Wellenius 1983); the liberalization processes in Europe (Eliassen and From 2007) and in developing countries (Petrizzini 1995) during the 1990s and early 2000s; the popularization of new telecoms such as mobile phone and the Internet and the linked macro-phenomenon of digitalization and media convergence. These and other elements have put telecommunications at the center of political, economic, and media reflections (Balbi 2009).

The word "telecommunication" (tele = distance) significantly appeared after three of the technologies (optical and electrical telegraph and the telephone) were invented. The term was coined by Edouard Estaunié in 1904, it became of common use only in the 1920s, and it officially appeared in the ITU acronym (International Telecommunication Union) in 1932, referring simultaneously to telegraph, telephone, and radio and, later, television, satellite, mobile phones, and the Internet (Huurdeeman 2003; John 2010). Telecommunications have three distinctive elements from other technologies of communication over distances: first, telecommunicating means transmitting a message from one point to another in the space and, for this reason, telecoms are also named one-to-one communications (Balbi and Kittler 2012); second, telecommunicating means sending a message without the physical transportation of the message; finally, telecommunications' networks allow people/institutions to reply the received message (in other words, they are interactive). These strict, and historically not entirely proper, definitions help to distinguish telecommunications technologies from transportation systems, postal services and the mass media (broadcasting radio and television in particular).

Telecommunications have been considered by historians from political, economic, technological, and social perspectives. From a political point of view, they are crucial components of national communication strategies and politics manages them with different purposes according to national ideals and visions (Starr 2004). Furthermore, they were (and they are) instruments of power and they were adopted worldwide for military purposes and for governing territories, often believing that the control of information fluxes meant the political power *tout court*.

Telecommunications are also powerful economic instruments. First of all, in the past as in the present, telecommunication companies have gained an economic relevance considerably larger than other communication industries. Second, studying telecommunications means also understanding economic principles and concepts that surround network technologies: for example, natural monopoly (Albon 1986; Friedlander 1995; Helgesson 1999), direct and indirect externalities (Curien and Gensollen 1992), economies of scale (Davies 1994), the so-called club or network effect (recently called into question by John 2010), the path dependency (David 1985), among others.

Telecommunications have a relevant and visible technical dimension. The *macro-systèmes techniques* (MST) and the large technical systems (LTS) approaches have defined telecommunications historically and sociologically as complex physical artefacts, combining networks of communication, political, economic, and social organizations (Gras 1997; Hughes 1987).

Telecommunications, finally, have a relevant social dimension often expressed through the network's metaphor. This term is quite ancient, and it first appeared meaning the fishing net and/or the texture, then during the Renaissance was used in connection with the body (clothes but also human tissue) and, at the end of seventeenth century, network finally became a system planned and constructed by engineers (Musso 1997). In other words, the term "network" was created before the invention of telecommunications, but was commonly used only after the diffusion of these communication technologies. Among many examples of social studies of telecommunications, two are the most popular. First, Manuel Castells based his work on the self-expanding telecommunications network logic with presumed social effects (Castells 1996–1998). Second, one of the leading theories of contemporary history of technology, the social construction of technology (SCOT), has often analyzed telecommunications as historical and co-constructed elements of the society (see, for example, Douglas 1989; Marvin 1988; Fischer 1992; Abbate 1999; Balbi 2011). Disciplines that have considered the history of telecommunications are not self-excluding but, on the contrary, the best works on this subject combine all the remembered dimensions (political, economic, technical, and social).

This chapter aims to introduce the readers to telecommunication history as a field. In order to be more readable and schematic, the chapter is organized by technologies in chronological order, but more attention should be given to the political, economic, and social dimensions than to the technical ones. It focuses inevitably on Western Europe and North America, where the greatest part of literature on telecommunication history has been written, but it also attends to other regions like Asia, Africa, and South America. This chapter, finally, is a work in progress and it aims to give to students a general overview of the field, to be completed by further regional histories and, hopefully, by new techniques and topics of research.

#### THE OPTICAL TELEGRAPH: STATE AT WAR

Smoke, visual, and acoustic signals, flags, and carrier pigeons were common ways to communicate outcomes of battles, geographic positions, and many other aspects of social reality from ancient Greece to the end of the eighteenth century (the pigeons had even a relevant role in the First and Second World War as "alternative" technologies). Furthermore, an efficient postal system was established in China and later in Europe in the sixteenth century by the famous Taxis family (Behringer 1990). In other words, the desire to communicate over distances has always distinguished human history, but, until the end of the seventeenth century, experimental systems were not evolved or completely reliable: messages were often altered through transmission, their meaning had to be previously established (visual and acoustic signals), and they had to travel at

the same speed as the carrier (horses for postal systems or pigeons). Communication systems were too poor, too expensive, and too difficult to use.

It was during the French Revolution (1789–1799) that, for the first time, a message could be sent in a complex language and could travel more rapidly than any previous system, permitting the separation of communication from transportation.<sup>2</sup> In 1794 Claude Chappe presented to the French Assembly his "optical telegraph" (from Greek *têle* = distance and *graphê* = writing), which had *in nuce* all the elements of future telecommunications: it was based on a permanent network established in a territory; the network's junctions were represented by towers surmounted by mechanical and articulated arms that could reach different positions; there was a kind of switching because special telegraphers received the message from the previous tower and transmitted it to the next one; finally Chappe presented a codified language representing numbers, letters and other conventional signs based on the positions that the arms could reach (Rosenfeld 2001). The Chappe telegraph was rapidly adopted in France during the Revolution, but the most relevant use of the first telecommunication was made by Napoleon first during his *coup d'état* in 1799 and, later, to control his troops: for this reason he promoted the construction of telegraphic lines in every new conquered territory in Europe (Headrick 2000).

Another relevant element of optical telegraphs, and typical of every technology of telecommunications, was the debate between public monopoly and private management (Flichy 1991). If in France the attempt of using the Chappe telegraph for other purposes than military and politics failed, English lieutenant B. L. Watson opened the first private lines in U.K. in the late 1820s: these commercial lines aimed to communicate ships' arrivals in harbors (in cooperation with the Lloyd's, an insurance company), but also to provide railways and stock exchange with information (Wilson 1976).

Despite this British attempt, the optical telegraph was mainly used for political and military purposes, so much so towers were often protected from external attacks by soldiers; Chappe telegraph was generally considered a public monopoly and its use had to be restricted to governmental affairs. The optical telegraph had a worldwide relevance, and it was adopted in every European country, with the exception of Switzerland (due to its mountainous terrain), in Africa (Egypt, South Africa, St. Helena island), in Asia (India), and in the Americas (Canada and the U.S.) (Wilson 1976).

This system had at least three gaps: first, it could not be used with bad weather conditions (such as fog or snow) or simply during the night because of the lack of visibility; second, the network was expensive because every single line was composed by several towers; third, it was a strict-band form of telecommunication because only one message could be transmitted through a single line (the difficulty of access was, and often is, the main argument in favor of public monopoly and public use of the telegraph) (Field 1994). These problems were all solved by a new technology: the so-called electrical telegraph.

#### THE ELECTRICAL TELEGRAPH: COMMERCIALIZING INFORMATION

During the 1830s, Samuel Morse in the United States, Wheatstone and Cook in the United Kingdom, and many other inventors in the rest of the world, patented a new medium of telecommunications that used electricity (it was one of the first commercial uses of electricity at all) for transmitting messages.

Early years of the electrical telegraphy were difficult because of general skepticism (only a few believed that transmitting messages through electricity was possible; Marvin 1988) and because of the optical telegraph. Compared to the "old" technology, the new one appeared

vulnerable (for example, wires and cables could be easily cut off) and, furthermore, it required new investments.<sup>3</sup> Nevertheless, electrical telegraphy had many elements in common with the optical version: first, it had a network, even if the electrical one was generally made of wooden poles, copper wires, and porcelain insulators, and it was more polycentric and diffused than that of its ancestor; second, towers were replaced by offices in which people could send their messages through new and precise machines (telegraphs) used by experts; finally, another language, called Morse code, translated messages in a sequence of dots and dashes.

Despite the slow start, during the second half of the 1840s, the electrical telegraph began to be adopted by many European countries, Canada, and the United States; other nations, such as France, where the Chappe maintained great relevance for a long period, Australia, Russia, and Switzerland introduced it during the first half of the 1850s (Huurdean 2003, chapter 8). At the same time, the electrical telegraph stimulated a debate over public and private control. In the great majority of European countries, the telegraph was considered a public monopoly, while in the United States, in Canada, and in United Kingdom (until 1869 when the service was nationalized)<sup>4</sup> it was managed by private enterprises. There were also mixed systems, in which public and private entities managed often disconnected telegraph networks: Argentina is a good example of it (Hodge 1984).

The electrical telegraph, just like the optical, was used for governmental and military communications. It played a significant role in many wars: in Crimea (1854), in Italian independence (1859), and in the American Civil War (1861) (Mattelart 1992, part 1). It helped modernizing countries, such as China, for a political economy decision of its government (Baark 1997). It was a tool of communication, control, and governance over Asian and African colonies (Noam 1999; Harwit 2008). The second half of the nineteenth century was characterized by an expansion of the most important European countries from their original boundaries to Africa, Asia, and South America, and the undersea telegraphic cables played a significant role in connecting the new colonies to the mother countries (Winsek and Pike 2007). The United Kingdom acquired a dominant position in this first global network and, at that time, London was connected with almost every place on earth (Headrick 1991). Also in Muslim countries, such as the Ottoman Empire, the telegraph became an ideal system of communication and unification over vast territories (Bektas 2000). In the 1930s and the 1940s, telecommunications played a similar and significant role for Japanese Empire expansion in Asia (Yang 2010).

Unlike the optical, on the other hand, electric telegraph was used for economic and social purposes and maybe this helps to make it enter into the popular imagination. Thanks to electric telegraph, the stock market acquired a new rationality (Hermans and de Wit 2004); railway networks had an info-structure for regulating the traffic and preventing accidents (Beniger 1986); newspapers changed their structure (the so-called mosaic form was created; McLuhan 1964) because of the creation of press agencies strictly linked with telegraphy (Blondheim 1994). The social relevance of the telegraph is also testified by its strict link with religious movements: for example spiritualism—a movement centered around the practice of communication with the dead, born in mid-nineteenth century and soon popular worldwide—saw the telegraph and later the telephone and wireless as technologies of connection among bodies and souls (Czitrom 1982; Peters 1999, chapter 4; on religion and telegraphy, see Stolorow 2006).

Travelling at the speed of electricity, the message sent through telegraph lines covered a great deal of space in short time and this implies at least two consequences. First, it could link far-away cities in big countries where in the past big spaces created difficulties of communication (an interesting example is Australia, where the telegraph anticipated the railways networks, Moyal 1984). Second, the telegraph acquired immediately an international dimension. It became so indispensable for communicating among nations, for commercializing international goods, and for keeping

international contacts among people that the first international organization was set up to regulate the telegraph indeed: it was named International Telegraphic Union (today the ITU).

## THE TELEPHONE: TELECOMMUNICATIONS AT HOME

The telephone (from Greek *phōnē* = voice, sound) was maybe the most contested invention in telecommunication history: between the 1850s and the 1870s, Philipp Reiss, Antonio Meucci, Thomas Edison, Elisha Gray, and Alexander Graham Bell claimed to be the inventor of the telephone and many countries had scientists that thought, discovered or patented elements of the “speaking telegraph” (Coe 1995).

As the term “speaking telegraph” suggests, when the telephone was patented in the second half of the 1870s, it was perceived as an upgrade of the old and apparently similar medium, the electrical telegraph; Bell and Gray, for example, discovered the telephone when they were working on a “multiple telegraph.” The telephone soon appeared to be quite different from the telegraph for some reasons. First, it was a domestic medium, maybe the first that broke barriers between public and private sphere (Bertho-Lavenir 1981). Second, contrary to the telegraph, the switching phase was crucial: up to the 1910s–1920s, human switchboard operators managed it and later they were substituted by automatic systems. Third, the telephone was a talking medium and, unlike the telegraph, it didn’t leave “written trace” of communications (a significant element because for a long time it was not used in commercial transactions). Finally, especially at the beginning, telephone networks were basically urban, while the telegraph was a long-distance telecommunications: for this reason the telephone must be compared more with gas or water than telegraphic networks (John 2010).

Governments wondered about the best system to manage the new medium, and three main models were adopted. At first one made the telephone a public monopoly managed by national administration, just like the telegraph; this was a *full* public model, adopted in a few European countries in the 1880s and more and more popular during the 1890s, when in Europe the majority of countries nationalized telephone networks. A second model, quite common in Europe in early years and durable in Northern Europe, was a *mixed* system: the state licensed urban networks to private companies and managed autonomously the long-distance network that, at that time, appeared to be more strategic (Millward 2005, chapter 7; Calvo 2006). A third model, basically adopted in the United States and Canada (Armstrong and Nelles 1986), was completely private: Federal government and municipalities licensed the entire network to private companies but was watchful of monopolies (the dominant position of Bell Company, later AT&T, worried U.S. society for long time).

The landline telephone in the United States soon flourished; in Europe, it entered into everyday lives only after the end of the Second World War; in Africa and Asia (except from Japan) never completely had success (see Casson 1910, for an early comparative history). From political and economic perspectives, in the United States, the telephone was soon considered an indispensable tool for commerce and private life; in Europe, with few exceptions, the telephone remained for a long time a governmental tool and political decisions affected its development in many countries (e.g., Germany, France, Italy, and Spain). In Russia, it was seen with suspicion as it could favor horizontal communications (Star 1990). In many Asian and African countries, mainly due to the low degree of industrialization, education, linguistic diversities, social developments, and political circumstances, it did not receive wide acceptance or become a social habit (Huurdean 2003).

Even if the main purpose of the telephone was still economic rather than social, the telephone

was largely used in everyday life, probably because it was available in offices and homes and, except from the switchboard operators' mediation, the access to communication was "direct."<sup>5</sup> The telephone shaped the social imaginary between nineteenth and twentieth centuries, arousing new social hopes and fears (Young 1991): it seemed to favor and, at the same time, to put in danger social relationships; to destroy hierarchical power and to increase possibilities of monitoring; to reassure people at home because it could be used for emergencies and, equally, to put on danger their privacy.<sup>6</sup> The most significant social issue at that time was women's involvement in using the new medium. Historical literature on the telephone has often concentrated on female switchboard operators and on the massive use of the telephone by women: the telephone indeed was the first medium of telecommunications used by women to coordinate home matters such as doing the shopping, buying furniture, and, especially, chatting and maintaining social relations (Fischer 1992; John 2010; Martin 1991; Marvin 1988).

#### PANTELEGRAPH AND FAX, PICTURE-PHONE AND TELEVISION: CHANGING THE VISUAL

Sending fixed images has a completely different story than that of transmitting moving images, but they are both part of telecommunication history—the first story is linked to the telegraph and the second to the telephone.

Telegraphy does not only mean exchanging dots and dashes, but also sending and receiving *fixed* images. Alexander Bain presented his chemical telegraph at the Universal Exposition of London in 1851. His system was based on two pendulum linked by a telegraph wire; the transmitting pendulum "scanned" pictures, drawing, maps and sent them to the receiving (and coordinated) pendulum. Between the end of the 1850s and the early 1860s, this system was improved by Giovanni Caselli and renamed pantelegraph (from Greek *pân* = whole and universal because it sent every kind of messages, written or drawn). Later, many inventors worked, often at the same time, on the transmission of images; in 1881 Englishman Shelford Bidwell constructed the scanning phototelegraph, around 1900 German Arthur Korn invented the Bildtelegraph, and French Édouard Belin patented the Belinographe, to name a few.

Interests in the transmissions of images re-appeared in different historical periods. Caselli's pantelegraph was of interest to the Chinese empire because Morse code could not be used to send ideograms and China would run the risk of being cut off from international telecommunications, but negotiations with China, Italy, and France failed (McConnell, Bodson, and Urban 1999). Around the 1880s and 1890s, newspaper publishers wanted to gain more readership by using pictures. Between the 1920s and the 1940s, armies sought weather reports and war maps. After the Second World War, thanks to the Japanese electronics industry, interested in sending ideograms just as the Chinese had been in the past, and society's growing interest in the image (Nosengo 2003), the long history of visual telecommunications produced its first and long-lasting success: the fax (Coopersmith 2010).

Exchanging *moving* images was seen as a natural extension of the telephone. Picture-phone is may be the most forecasted medium in history, a technology that has often been about to be marketed (Norman 1993), but, as a point-to-point medium, it could be considered one of the greatest failures of communication history (Ortoleva 1998; Lipartito 2003). Despite the various attempts of commercialization, transmissions of moving images became popular as a one-to-many medium: since the 1920s, television started to mean one-way (broadcasting) communication and the picture-phone idea was abandoned, coming back from the dead only recently with video cell phones and Skype (Hickethier 2008).

#### THE WIRELESS TELEGRAPHY: (TELE)COMMUNICATING EVERYWHERE

Guglielmo Marconi's successful experiment in 1896 was only the last effort made by many scientists in the second half of the nineteenth century. Just to name a few, Hertz, Popov, Branly, and Lodge had all in mind to study ways for producing and receiving waves, while Marconi had two new ideas: using these waves for sending and receive messages by air (or better the ether) and making efforts for sending messages as far as possible (Aitken 1976).

Wireless telegraphy, once again, harked back to the electrical telegraph aiming to solve two weaknesses of the old medium: first, removing the most expensive component of telegraphic networks (wires and cables) and, second, communicating in motion because electric telegraphy allowed exchanging messages only between two fixed points in the space.

Wireless telegraphy impressed contemporary society, and in newspapers, books, and popular imaginary wireless telegraphy was constantly present and often linked with paranormal phenomena (Natale 2011). Marconi himself became a kind of myth, and the new technology soon sharpened the appetite of international and powerful companies. British Marconi and German Telefunken (and later French Société Générale and American RCA) fought to control the international spectrum and to become monopolists of this sector at the international level (Hugill 1999). This major struggle was eventually resolved with an agreement among the four companies that divided the entire world into influence areas (Tomlinson 1945).

Wireless telegraphy was the natural substitute or, better, a fulfillment of submarine telegraphy (Finn and Yang 2009): wireless was cheaper (unrolling cables under the sea was extremely expensive) and it used a free channel like the ether. At the same time, wireless endangered the international monopoly acquired by Great Britain over international telecommunications and it represented a possibility for the United States, France, and Germany to free themselves from British communications (Douglas 1989; Friedewald 2000).

Between the 1900s and the early 1920s, the wireless telegraphy was used for three main purposes: communication between means of transport (especially ships) and land stations; military transmissions (e.g., during the Anglo-Boer wars and the First World War) in order to coordinate ships and later planes; finally it was used for political needs and, once again, for communicating between colonial holdings. Being cheaper than cables, nearly every European country decided to establish wireless stations in Asian and African colonies and this helped colonialists to more easily administer their colonies. In addition, this was often the first telecommunication technology implanted in poor countries. Establishing wired networks was often impossible economically unsound in inhospitable and vast lands and wireless communication solved both problems (see, for example, Anduaga 2009, on the wireless British Empire; Friedewald 2000, on Germany; Griset 1996, on France).

At the beginning of the 1920s, wireless telegraphy gradually transformed itself or, better, expanded its uses. From the invention of the audion by Reginald Fessenden in 1908, the wireless telegraphy carried not only dots and dashes but also voices: a new point-to-point medium was born, the wireless telephony (Hong 2001). This medium, however, began to be used in a different way by "strange" users, the so-called radio-amateurs, people interested in sending and receiving messages as well as listening to music, information, and entertainment (Bartlett 2007). Amateurs gradually became users of another wireless medium, based on the one-to-many form of transmission that became popular worldwide only during the 1920s: radio broadcasting. Radio could be considered an "unexpected use" of wireless telephony, unexpected for Marconi, too, who fought for a long time the possibility that everyone could listen to point-to-point transmissions.



## SATELLITES: A GLOBAL AND EXTRATERRESTRIAL NETWORK

When Arthur C. Clark, writing an article for *Wireless World* in 1945, prefigured a global network of telecommunications constituted by three satellites<sup>7</sup> (from Latin *satellite* = bodyguard) built with the combination of British radar and German V-2 rockets, research on satellites had still to begin (Clark 1945). In the first half of the 1950s, in a climate of Cold War, the United States decided to develop a program to launch a satellite between 1957 and 1958. However, between October and November of 1957, the Soviet Union preempted the United States and successfully launched *Sputnik 1* and 2, the world's first artificial satellites. The Soviet satellites had little more than a demonstrative function, but they achieved an extraordinary psychological effect on a U.S. society that suddenly realized the technological advancement of Soviet Union. U.S. reaction was quick and, in 1958, it launched its first satellite (*Explorer 1*) and created the National Aeronautics and Space Administration (NASA) for developing a permanent space program (Neal, Smith, and McCormick 2008). From that time on, the United States perceived satellite policy as a kind of extension of domestic communications and acquired a dominant role in it (Hills 2007, chapter 2).

During the 1960s, satellite technology developed, and many countries began to be interested in it. In 1964 the International Telecommunications Satellite Organization (INTELSAT) was formed with the cooperation of nineteen countries and in 1965 it launched its first geostationary satellite, the famous *Early Bird* (Butrica 1997).

Satellites had, and still have, three main functions.<sup>8</sup> First, they are military "weapons" because they can monitor every place in the world, and they have more and more acquired the ability to detect people, troops' movements, and weapons from thousands of kilometers. Second, after the launch of *Telstar 1* in July 1962, satellite television became possible, and the first experimental transmissions were launched between Europe and United States. For the first time in history, satellite TV allowed to broadcast worldwide events such as the Olympics or soccer world cups, or to create new international channels and shows, or finally to find an alternative channel to terrestrial and cable television (Negrine 1988; Schwöck 2009). Finally, satellites were and are used as telecommunications: *Telstar 1*, for example, allowed not only TV transmission, but also telephone and data signals. This implied a geographic extension of telephony because satellite communications potentially reach every part of the world.

## THE CELL PHONE: A CONSTANT TOUCH

The main dream of wireless telegraphy and telephony (communicating from point to point without wires) came true only during the last twenty years of the twentieth century, with the so-called mobile phone.

Experiments in mobile communications were conducted during the entire century, but only in 1977 did AT&T establish an analogical network of cellular phones in Chicago. The first commercially automated cellular network was launched in Japan by NTT in 1979, initially in the metropolitan area of Tokyo. Within five years, the NTT network had been expanded to cover the whole population of Japan and became the first nationwide 1G network (Steinbock 2003). During the 1980s, European countries also launched their system of mobile phone networks, but the United States, for many reasons, remained backward. In 1981 and 1982 Northern European countries (Denmark, Norway, Sweden, and Finland) joined in the so-called Nordic Mobile Telephone Group (NMT), a project that aimed at promoting a rational development of mobile phone. This was the first network featuring international roaming and, indeed, it was used in more than 40 countries (including those in Asia, Russia, and Eastern Europe) (Goggin 2006).

The real success of the European mobile phone market, as much as it was called a "bureaucratic miracle," was the launch of a Continental common standard: the Global System for Mobile Communication (GSM) in December 1992 (Agar 2003). GSM was a European, and later worldwide,<sup>9</sup> network, thanks to which cell phones could cross national borders without problems (so-called roaming). GSM allowed decisive technical improvements too: a better signal quality; rationalization of frequencies; increasing of potential number of subscribers; finally the introduction of SIM card.

The mobile phone could be considered one of the greatest and more global successes in media history, and, in 2010, there were around 5.4 billion cell phones worldwide. Cell phones also succeeded in developing countries or anyway where telecommunications had been scarcely diffused in the two centuries before, overcoming the old point-to-point technologies and solving long-standing problems of communication over distances. Among the most cell phone-equipped countries are China (860 million of cell phones, around 64% of population) and India (752, 62%); Russia, Indonesia and Brazil have more than 200 million of subscribers.<sup>10</sup> Also in Asian, African, and Australian, the cell phone represents the realization of a long-standing desire for a new and cheap way to communicate and to enter the global network for the first time in history (Hjorth 2008; Alzouma 2008; de Bruijn, Nyamnjoh, and Brinkman 2009). One interesting example of the mobile adoption of previously excluded societies is its use among nomadic communities in Russia, where the cell phone represented the first telecommunication technology to be used ever (Stammmler 2009).

Finally, the cell phone has also become a very popular subject for sociological research. Many books and papers have pointed out the relevance of mobile communications in affecting social life (e.g., reducing physical contacts, allowing a constant accessibility, and destroying private life), not unlike the hopes and fears aroused by the landline phone (Larsen 2005). In the long history of telecommunications stereotypes have often been repeated.

## CONCLUSION 1: FOUR LONG-STANDING CHARACTERS

This history of telecommunications is lacking. I could have added other technologies,<sup>11</sup> I could have told different histories in different ways, and I could have considered other ideas of telecommunications.<sup>12</sup> However, the selected examples should help readers understand at least four different aspects of telecommunications' history.

First of all, telecommunications are produced by different social groups and social interests—political, economic, technical, and user dimensions—and all of these elements must be considered when studying telecommunications historically.

Second, in the history of telecommunications, there are continuities, long-standing ideas that can be understood only with a *long durée* perspective (Braudel 1969). One example is the never ending competition between public and private management. Public management is generally considered better for popularizing telecommunication networks, for giving equal access to entire population, for gaining the "public good," for cheaper rates,<sup>13</sup> and it is often established during wars or dangerous periods. Private management is often seen as more efficient, more expensive, less wide spread (private companies extend networks only when they are remunerative), more dangerous because companies of foreign countries could reach dominant positions or private companies, in general, could gain monopolies. Another example of continuity, from a cultural perspective, is the fact that every new medium of telecommunications was seen with a mixture of hopes and fears: from preserving peace to increase misunderstandings; from saving time to invade privacy; from decreasing physical distances to increase social fragmentation.

In the history of telecommunication, changes have a great relevance too. Looking at the last two hundred years of point-to-point technologies, at least three main changes may be identified. First, there has been an effective increase in places reached by telecommunication, from single cities, to nations, to continents, to the entire world. Telecommunications have enlarged the possibility to listen and to see instantaneously nearly everyone. Second, telecommunication devices have become faster and easier to use: from optical to electrical telegraphy, from manual telephone to cell phones. Also the amount of time spent telecommunicating has dramatically increased: the optical telegraph was used rarely, while the cell phone is used continuously (and compulsively). Telecommunications are the basis for the contemporary online life. A final expansion could be named democratization. Users of telecommunications have increased, and still are increasing, all over the world: from state communication with the optical telegraph, to commercial communication with the telegraph, to private communication with the telephone, to worldwide communication with the cell phone.

Telecommunications' history, finally, shows that there is a continuous process of imitation and diversification between the old and new generations. New telecommunications, at the beginning, are often considered with parameters similar to the old ones; see, for example, the strict relationships between optical and electric telegraph, telegraph and telephone (or speaking telegraph as it was called), wired and wireless telegraph, fixed and mobile phone.

## CONCLUSION 2: THE FUTURE OF TELECOMMUNICATIONS HISTORY

This chapter aimed to give an overview of global history and historiography of telecommunications, but future historians may need a few ideas of the directions this field is taking. In my opinion, telecommunications history will follow five patterns. First, the history of telecommunications will probably be more *comparative* because new international archives, such as that of the International Telecommunications Union, are emerging and because scholars write more frequently in a common scientific language, today English. A more comparative history of telecommunications means also, secondly, a more *comparable and collaborative* history: future scholars must be prepared to join colleagues in collective efforts that may better depict national specificities or international similarities. A third and linked pattern is the *transnational* perspective. International flows of tele-communications have historically carried out an action across national borders and, in that way, they offer relevant keys for better understanding political, economic, cultural, and media history of the future. A fourth line of research will probably involve new *geographical* dimensions. The history of telecommunications has been mainly produced by Anglo-American and Western European scholarship, and there are thousands of stories that need to be written in other regions of the world. Finally, telecommunications history will probably be more *inter-medial*. It means that future historians will have to study media systems as a seamless web of mass media and telecommunications, of past and present media.

The value of telecommunications history is great. It helps to look at the past with new perspectives because telecommunications have often been overlooked sources; new historical elements help expand the past, discover alternatives, and give new interpretations to old histories. In addition, the history of telecommunications makes better understanding of contemporary telecommunications and mass media. Finally, and quite surprisingly, the history of telecommunications is useful for the future. In the past, telecommunications could evolve in different ways and, especially at the beginning, their "interpretative flexibility" was extremely high; the telephone could become a kind of radio, television a kind of video-phone, wireless telegraphy became either a telegraph or a radio. The future is similarly flexible, and telecommunications will probably

transform itself thousands of times. Future historians of telecommunications must be prepared to discover the instability of the past.

## NOTES

1. I would thank Andrew Butrica, Richard John, Peter Simonson, and John Jackson for their critical readings of earlier drafts of this chapter.
2. Carey 1989, chapter 8. He claimed that the first medium in which there was an effective separation of communication from transportation was the electric telegraph. If this may be true for the popular understanding of the term "communication," it is not historically correct, because the optical telegraph was first to allow this separation.
3. Telecommunications networks are expensive, and so the first established networks have a kind of competitive advantage over the others. In other words, the old seems to block the entrance of new competitors. This is generally called "natural monopoly."
4. The UK represents an interesting case in telegraph history because it was the only country where the telegraph passed from the private to the public management (Kieve 1973).
5. Sending a telegram was more difficult than making a telephone call because people had to go to the telegraphic office and give written messages to operators, who translated the messages into Morse code, and sent them. The receiving office had to retranslate the messages and deliver them to the receiver.
6. Ithiel de Sola Pool called them "dual effects" and, according to him, they contributed to scholars' reluctance to study the telephone (Pool 1974, 4).
7. Clark understood that only three geostationary satellites, moving at the same speed of the Earth and stationary with respect to a fixed point on the rotating Earth, would provide coverage over the entire planet. This was the model later applied to satellite communications.
8. There are several other main uses for satellite communications, and their importance has been international as well as national and regional: for example, they have been used for creating a national unity and national language. For a more comprehensive overview see Butrica 1997.
9. GSM was founded by eight countries in 1992 and, by 1996, 103 countries (many of them outside Europe) had already joined it. It was not the only second-generation cell phones standard: apart from GSM, at least two other standards were used in the United States, Latin America, and many other countries: the CDMA (Code Division Multiple Access) and TDMA (Time Division Multiple Access).
10. For statistics see <http://www.itu.int/ITU-D/ict/statistics/>.
11. The history of the Internet does not appear in this chapter because it is discussed in this volume by Peters and Nielson.
12. For example I did not devote enough space to alternative uses of the mentioned technologies as I did in other works of mine (Balbi 2010).
13. All these aspects were often discussed in telecommunication history and involved the concept of "universal service" (Mueller 1997 and on the history of this concept Dordick 1990).

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## 12

## Radio Broadcasting

Christopher H. Sterling

Whether or not radio is "dead" as some critics argue, the medium has had a nearly century-long history and impact, one that is increasingly well recorded in print and otherwise. But the radio experience has varied greatly, depending largely on where one listened. After a brief survey of radio's development, this chapter assesses radio's historiography (largely of American radio as a case study) to indicate what exists and what remains to be discovered.

## PART ONE: DEVELOPING RADIO

Radio's global history can be viewed in four broad periods—the development of wireless prior to broadcasting in 1920, the medium's era of dominance 1920–50, post-television radio 1950–90, and the growing digital competitive scene since 1990. Naturally, the pace of radio application and development varied greatly across countries.

## Before Broadcasting (to 1920)

Wireless telegraphy was pioneered by numerous innovators in different countries—no one person "invented" radio or its eventual application to broadcasting.

## Invention and Innovation

Though based in part on wired telegraphy technology, wireless was first theorized by James Clerk Maxwell, a Scottish theoretical physicist. He surmised in the 1860s that an electrical signal introduced into the "ether" could be received elsewhere without any wire connection. Two decades later, German physics professor Heinrich Hertz first proved Maxwell correct with small laboratory experiments. By the 1890s, scientists and engineers in Germany, France, Russia, Britain, and the United States (and likely elsewhere as well) were seeking to develop useful wireless systems. The first successful such innovator was Guglielmo Marconi, a young and largely self-educated experimenter in northern Italy. By 1895 he had combined the work of others with many of his own ideas to create the first effective means of wireless communication.

Unable to interest Italian authorities in his ideas, he traveled to London and by the late 1890s was working with British military and post office officials as he sought to improve his system's capabilities. He and his backers sought commercial applications that would generate revenues to

support continued research. In 1901 he transmitted the Morse code letter "s" across the Atlantic to widespread acclaim. In the United States, Lee de Forest and Reginald Fessenden were among a handful of experimenters working on similar lines, seeking commercially-viable systems of both wireless telegraphy (Morse code) and telephony (voice and music). Fessenden was the first to transmit the latter, about 1905–06. De Forest developed an important vacuum tube that, as it became better understood, could be used to amplify signals. Many others tinkered with different wireless systems.

### Applications

The world's oceans figured heavily in early wireless—communicating over or on them. Global communication was dominated by undersea telegraph cables, which as a medium lacking competition, charged high transmission prices to its government and business users. Marconi, Fessenden, and others worked to perfect a wireless means of spanning oceans in competition with the cables. By the middle of the twentieth century's first decade, Marconi and the German Telefunken, among other companies, were offering the first such services.

Some navies (and merchant shipping firms) soon recognized how valuable wireless could be in communicating with ships at sea—heretofore an impossibility. The Royal Navy and U.S. Navy were among the first to conduct experiments (in the late 1890s) and began to install radio equipment on major vessels. So did Cunard, North German Lloyd, and other passenger lines. By 1910, shipboard wireless was standard aboard larger ships. Loss of the *Titanic* in 1912 sparked huge public fascination when 700 passengers were saved thanks largely to wireless emergency messages.

World War I prompted substantial investment in and rapid development of improved equipment and methods for both wireless telegraphy and telephony equipment designed for military needs on land and sea. Movement of Britain's and Germany's huge armies and wide-spread fleets were only made possible using radio to coordinate the efforts. By 1918, even some aircraft were fitted with crude equipment. During the war, thousands trained to be radio operators, many returning to post-war life and applying their radio expertise as amateurs or "hams."

The notion of transmitting voice and music to an unseen audience—broadcasting—developed only slowly, and again in several places. In the United States, for example, de Forest transmitted several operatic performances before 1910. Charles Herrold may have been the first to broadcast on a scheduled basis, starting about 1909 in San Jose, California, as an adjunct to his radio training school. Several universities experimented with wireless equipment and broadcasts, some on a scheduled basis. World War I stopped most such efforts, but experimenting resumed in 1918–19 in Europe and the United States.

### RADIO'S "GOLDEN AGE" (1920–50)

For three decades, radio broadcasting offered the world's only electronic mass medium, leading to a golden age of well-funded creativity and huge audiences. Very different systems of radio broadcasting originated in different parts of the world.

#### Early American Radio

Several stations began scheduled broadcasts in 1919–20, with Pittsburgh's KDKA often identified as the "first." These early operations aired for only a few hours a week and had to develop

their own content, chiefly music and talk. There were few conventions on which to base programming, save for vaudeville acts, lectures, and recorded music. Hours of service slowly expanded from evening into daytime hours as more programs became available. Telephone giant AT&T operated stations in New York and Washington, and experimented with networking multiple outlets using its own telephone lines. Many stations crowded onto the air—some 500 in 1922 alone—forcing outlets to share time on the handful of frequencies available. Interference among stations was rife. But enthralled with the magic of sounds coming out of the air, listeners could purchase manufactured battery-powered receivers by 1921, or make their own. Speakers were separate and crude, and much listening was with cumbersome headphones.

Much changed in 1926–28 as American broadcasting took on much of its present structure. Government licensing of transmitters, in place since 1912, was much improved by the Radio Act of 1927 that created a Federal Radio Commission with the discretion to remove stations if they caused interference. The Radio Corporation of America purchased the AT&T stations and using them as anchor operations, created the National Broadcasting Company (NBC), the first permanent national radio network in the fall of 1926. What became the Columbia Broadcasting System (CBS) began to compete within a year. These networks allowed stations in smaller markets to share New York quality stars and programs, and made the medium more appealing to advertisers. By the late 1920s, advertisers expanded their once limited use of radio time to sell products and services, and the commercial support of U.S. broadcasting was confirmed. At the same time, early audience research began to provide advertisers with information on who was listening to what, how much, and when. Finally, program conventions with standardized formats, and types, were largely established. The record and radio industries soon proved mutually beneficial, as broadcasting records promoted their sales.

The 1930s saw networks create the present variety of program types, most of them financially supported by the sale of advertising time. A handful of non-commercial education stations suggested what might be accomplished for schools and colleges. Broadcast news developed slowly until late in the decade when growing tension abroad led the networks to form and rapidly expand their news reporting capability.

#### Radio 'Round the World

European radio systems differed substantially from the American commercial model. The first stations in 1919–22 were often commercial experiments operated by equipment manufacturers. The original British Broadcasting Company (1922–26) was such a company, providing service to London and soon to other parts of Britain. Appalled at the seeming chaos of the American system, and dedicated to a socially constructive use of the medium, in 1926, Parliament changed the structure of British radio to one of the BBC as a public corporation operating with government and listener receiver tax funding rather than advertising, and doing so under conditions of a renewable royal charter. Most countries in Europe took a broadly similar approach. Their public service programs emphasized culture, "good" music, education, and public affairs and only then offered entertainment, and that of a high level. Radio was closely identified with the social and political elites in most nations.

Stations operated on both AM and shortwave channels. Countries with colonies in Africa and Asia established public service structured stations for their own nationals living abroad. Programming for native populations was largely ignored in these stations that served colonial capital cities. Countries in the British Commonwealth, including Canada, Australia, and India, generally followed the BBC model in their domestic radio services. By the 1930s, Radio Luxembourg was offering advertising-supported popular music and other programs (closely



paralleling American practice) to audiences in Britain and Europe, to the consternation of public service broadcasters.

The rise of fascist dictatorships in Germany, Italy, and Spain led to centralization of their radio services, all controlled by government ministries. Radio began a government voice box and propaganda service. Japan followed suit. Their first radio stations were established in Tokyo, Osaka, and Nagoya in 1925, at first operated largely by newspapers. In 1926 they were merged in a single state company (now Nippon Hōsō Kyōkai, NHK), based in Tokyo. The military-controlled government dominated NHK by the late 1930s. Even listening to radio from other countries became a crime in each of these nations.

#### War and Rebuilding

Radio became a dominant means of domestic morale building during the 1939–45 war years. Radio news was the chief means of reporting war progress to “home front” listeners in all fighting nations. CBS newsman Edward R. Murrow and many journalists helped to create U.S. radio journalism with their on-site broadcasts, generally operating free of government censorship. BBC journalists provided similar insight. Wartime events and people even filtered into entertainment programs, some of which originated from military bases. The total hours of network radio news broadcasting increased steadily through 1944. Listeners couldn’t buy new radios, as production of consumer products disappeared due to military production priorities. Equipment became hard to repair as parts grew scarce.

Radio propaganda dominated the airwaves, especially as practiced in Germany. Such broadcasts often softened up countries facing invasion. “Lord Haw-Haw,” “Axis Sally,” and “Tokyo Rose” all became well-known traitors broadcasting for Axis powers—and there were many more. Each sought to broadcast news and features extolling the Axis, along with popular music and “news from home” to weaken the resolve of Allied soldiers and sailors, as well as countries not (yet) involved in the war, such as those in Latin America. Germany created numerous fully-automatic stations operating radio’s first audio tape systems. The BBC and the newly-formed (1942) Voice of America struck back with news and feature programs. By 1945, however, most European broadcasting systems had been destroyed, laying the ground for their rebuilding with FM service in the 1940s and 1950s.

Developed in the United States during the 1930s, chiefly by Edwin Howard Armstrong, few FM stations made it on the air before American entry into the war, which then froze further expansion. The American allocation of FM channels was increased in 1945, but also shifted higher in the spectrum which slowed growth of the new radio service as there were few available receivers. Hundreds of new FM outlets took to the air, but many soon stopped service due to small audiences and little revenue.

#### RADIO AFTER TELEVISION (1950–90)

With the global spread of television broadcasting after 1950, radio’s role was slowly transformed. As audiences and advertisers transferred their loyalty to video, radio sought a new role. The transition was aided by technical advances including audiotape and later stereo recording and, after about 1970, introduction of satellite relays and cable radio channels catering to specialized audiences. All helped to improve the sound quality of music programs and to reach larger audiences. The 1980s saw development of portable radio-cassette players and headsets, which revolutionized the concept of personal listening, though, at the same time, adding further competition for broadcasters. Introduction of the compact disc in 1984 foretold a digital revolution to come.

#### Top 40 and Public Radio in America

After dominating U.S. commercial radio for a quarter century, by the early 1950s, network service had declined to little more than occasional news and a few daytime serials. For the first time since the early 1920s, stations were forced back on their own resources—and most adopted an eclectic variety of music and talk programs that partially imitated what the networks had formerly provided. But their audiences continued to decline, even as more outlets took to the air. Several developments turned things around for the radio business.

Todd Storz and Gordon McLendon were among the chief innovators who in the mid-1950s melded several trends into what became radio’s salvation—Top 40 radio. Tightly formatted by playing only the most popular rock ‘n’ roll music with a minimum of disc jockey (“DJ”) chatter and incessant promotion, the stations were largely aimed at younger listeners. American teens had more leisure time and income to spend on the new (1954 saw the first go on sale) portable transistor radios. Now radio could go anywhere, anytime.

By 1958, FM reversed its post-war decline, beginning in major cities. More receivers became available and FM was the only way to add stations in crowded urban markets. The FCC approved a system of using FM transmitters for supplementary services (1955) and then stereo (1961) and both boosted interest in the medium. Though fought hard by the radio business, the FCC’s demand that co-located AM and FM stations broadcast different material proved to be the real key in promoting new stations, growing audiences, and greater advertiser interest. By the 1960s, half the country’s households owned an FM receiver; FM was the fastest growing broadcast medium. Within two decades it was also the most listened to. By 1990, 75 percent of all American radio listening was to FM outlets. The older AM stations reverted increasingly to talk-based programming, including commentary, news, and sports, leaving music to the higher fidelity of FM.

Non-commercial radio began in the United States in the 1920s, but by World War II, only about twenty-five such stations remained on the air due to lack of funding or defined purpose. FCC approval of FM radio changed the picture, for the agency reserved some channels for non-commercial operators, the first time such action had been taken. Slowly through the 1950s, and then more rapidly, educational and community stations took to the air, providing an alternative program service to the dominant commercial outlets. In 1967, Congress passed the Public Broadcasting Act which created the “public” name, increased federal funding to partially support such stations, and set up a new national system that still operates. National Public Radio began providing programs in 1970 as the first true network for such cultural and public affairs programming. With its news and public affairs (just as such programs were disappearing from commercial outlets), it attracted a small but highly influential audience of social and political movers and shakers.

#### Radio in Europe and Elsewhere

The addition of FM radio offered post-war Europe distinct improvements in clarity of signal and the number of stations could place on the air, and the new service played a central role as countries rebuilt their radio systems. Likewise, FM was a boon to tropical colonies (which became independent countries in the 1960s and 1970s), as it did not suffer the atmospheric interference that plagued AM stations.

Concerns over the growing cost of public service radio and television, as well as broader political and social change, led to the “liberalization,” or abolition of many traditional broadcasting monopolies in western Europe during the 1970s (for example, Britain introduced commercial radio in 1974) and 1980s, followed by eastern European and Asian nations in the 1990s. Most Middle

Eastern and African nations retained their government-dominated public service radio systems. In Europe, new private (and commercially-supported) stations often emphasized popular music. Program variety increased with the competition between private and public broadcasting systems. FM service was used for many of the new channels introduced by European stations, and made possible introduction of stereo broadcasts in the 1960s. The increase in the number of channels led in Europe to increased specialization, most networks devoting one channel to light entertainment and one to serious music and cultural programs. By the 1970s this was somewhat counteracted by the growth of local stations as had always been the norm in American broadcasting.

### Radio in Developing Nations

The potential of radio in supporting the complex national development process was first recognized in the 1950s, leading to several experiments in applying radio broadcasts to improvements in health, agriculture, education, and other aspects of nation-building. Radio could readily overcome problems of transport and distance to serve the largely rural populations typical of developing countries—and do so far less expensively than most other media. Nearly everywhere, radio stations were built first in the capital and other cities, then in rural areas as facilities became available.

Most African, Middle Eastern, and Asian countries operated government-run radio that could readily be used this way. Latin American countries, on the other hand, have always operated on the American model of private radio stations supported by advertising, although some public radio stations are controlled by government ministries (indeed, one or more “national” stations are typical). So, in South and Central America, the government stations were more likely to be used for national development campaigns.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) was one global agency involved in extensive experimenting with radio in development. Sometimes working with the International Telecommunication Union (ITU) or the World Bank, radio experts were assembled into UNESCO teams to help developing nations improve their radio systems so as to better assist in the developmental process.

Radio's widespread availability could also support dramatic regime change. Charismatic leaders appeared in the 1950s in Egypt and then Cuba. Gamel Nasser (who helped lead the coup that overthrew corrupt Egyptian King Farouk) used radio for hours-long speeches to his people and others in the Arab Middle East. Following the same model, Fidel Castro (who overthrew the corrupt Batista regime in Havana) would often present three and four hour speeches over Radio Cuba. Both leaders used radio as a megaphone to increase their support at home and foment change in neighboring nations.

### RADIO'S COMPETITIVE CRISIS (SINCE 1990)

Radio since 1990 has faced growing competitive challenges driven largely by technological change but also by shifts in governing policy. Indeed, a growing variety of consumer options have assured that in the early twenty-first century, once unique radio is no longer special. Many argue its days are numbered. At the heart of the issue is the growing digitalization of life in industrial and developing nations alike.

Arrival of the CD in 1984 began the consumer evolution to digital systems, introducing listeners to a crystal clear recorded sound, soon available with portable players. The first audio services on the Internet appeared a decade later, offering a wide menu of music and talk formats

available to anyone with a computer and connection. Podcasting on the web imitated the sound and approach of radio stations. By the early twenty-first century, digital portable devices (“MP3” players such as the iPod) were rapidly diffusing to American households and those elsewhere. For the first time, portability of music and talk didn't require a radio signal. Younger listeners gravitated to the new devices and began to leave radio behind.

Many complained about American commercial radio and its limited menu. The 1996 Telecommunications Act allowed consolidation of radio ownership so that soon most communities had but one or two owners controlling all the outlets in town. This seemed to breed a sameness in programming as technology allowed centralized programming and even use of personnel through voice-tracking techniques. An announcer could sit in a Texas studio, for example, and with careful use of computer timing (and provision of some local weather and traffic information), pretend to be a “local” DJ in multiple communities across the country. Stations sounded increasingly alike, and also seemed to be airing more commercials. Listeners who sought classical, folk, or jazz music (to name just three) rarely found such formats on commercial stations.

Radio fought its new competitors with its own digital conversion. Very slowly, AM and FM stations converted to digital transmission (about 2,000 of 14,000 U.S. radio stations by 2010). But in most cases, they repeated FM's mistake six decades earlier in not offering and promoting new and different program content. Instead radio touted better listening quality even though people buy content first, and listening quality distinctly second. Europe agreed on a different digital radio technical standard and appeared to be making better progress in the transition.

### PART TWO: RADIO'S HISTORIOGRAPHY

Writing about radio is as old as the medium itself. Given space limitations, what follows centers largely on books about U.S. radio to indicate what has been done—and still needs to be. Even so, it is still selective, using examples to highlight larger trends. Most early radio studies, whether scholarly or popular, tended to focus either on radio's technology, or its programs and personalities. While the record has since improved dramatically, only a scattering of research-based books on U.S. radio's content, policy or history appeared before 1970. Broadcasters and advertisers researched commercially-useful information about listening audiences, eventually leading to statistically-reliable program ratings. A limited number of early studies were foundation-supported efforts examining radio policies, program trends, or radio's broader cultural impact. And a few studies made arguments for radio reform and greater educational use.

### Researching Radio

From those small beginnings, scholarly historical study of American radio has expanded greatly, especially over the past few decades (for a fairly complete listing and discussion of the American efforts, see Sterling 2009). Barnouw's historical trilogy (1966–70) marked the inception of serious American scholarly recognition of radio and broadcasting more generally, just as Briggs' five volumes on the BBC (1961–95) had a similar impact in Britain. Both authors made the study of radio academically respectable. The later rise of a culturally-based “radio studies” movement in Britain and then in the United States in the 1990s has encouraged further work as related in Chignell (2009). Appearance in the United States in 1991 of the *Journal of Radio Studies* (now *Journal of Radio and Audio Media*), and in Britain in 2003 of *The Radio Journal* provided the all-important scholarly outlets for radio-focused research. Historically-based reference dictionaries and encyclopedias devoted to radio (Godfrey and Leigh 1998; Sterling 2003; Street 2006b; Sies

2008; Sterling and O'Dell 2010–2011) all attest to the growing interest and supportive literature, as do such finding aids as Smart (1982), Greenfield (1989) and Siegel and Siegel (2006). And numerous archives and museums largely devoted to radio have appeared in America and abroad, providing still more grist for research efforts.

### Technology

The one subject for which history has provided a solid base is the medium's technology—indeed, the first wireless history appeared in 1899! Lewis (1991) brought radio's early history to a wide audience, thanks to a parallel Ken Burns television documentary. Among the most influential recent works are Aitken (1983) and Douglas (1987), both of which place radio's early development within a larger context. Hong (2001) compares and contrasts the early wireless innovation of Marconi and other important inventors. Brittain (1992) offers a stellar example of how the life of one engineer impacted several fields, radio among them. Hijiya (1992) is the only documented study on Lee de Forest. Seifer (1996) is by far the best biography of cult figure Nikola Tesla, balancing claims with achievements. Sakar et al. (2006) provides a solid engineering historical anthology about wireless, albeit highly technical. Greb and Adams (2003) rescue the story of radio pioneer Charles Herrold. Schiffer (1991) is a model of an author trained in one field (anthropology) who applies its methods to another, the rise of portable radio. Cones and Bryant (1997, 2003) and Wenaas (2006) provide stellar examples of radio manufacturer histories (on Zenith and early RCA, respectively) with extensive details on specific receivers intended for collectors. Berg (1999, 2008a, b) offers a superb history of short-wave radio and listening. Sterling and Keith (2008) provide an overall history of FM radio's first seventy-five years in the United States.

### Institutions and Economics

Smulyan (1994) explores the early commercialization of radio while Newman (2004) reviews early activist opposition to those radio ads. There are few local or market-based histories (most station or statewide histories are puff pieces issued by broadcasters); one exception is Jaker, Sulek, and Kanze (1998), who survey in directory fashion the many AM outlets that have served New York City. Godfried (1997) offers a case study of WCFL, a Chicago union-owned station. Roscigno and Danaher (2004) review radio's role in early 1930s' union struggles, and Fones-Wolf (2006) assesses how labor has been portrayed on the air.

Educational or public radio, the subject of many earnest books before 1950, has only recently caught on with historians. Sloten (2009) offers the best overall survey though Bianchi (2008) details once-popular radio schools of the air. Davidson (2006) relates the story of a pioneering educational station. Walker (2001) surveys community, micro, and even pirate stations to survey non-mainstream radio. Land (1999) and Lasar (1999) trace the story of the Pacifica stations. McCauley (2004) and Mitchell (2005) review the rise and expanding role of National Public Radio.

### Programs and People

Radio journalism and its reporters have been the subject of numerous studies. Not detailed here are the several biographies of Edward R. Murrow and other radio journalists. Jackaway (1995) reviews the bitter fight by newspapers to hold back radio news. Many books examine the shaping of network news and public affairs content in the 1930s and 1940s: Culbert (1976) began the trend with his study of six commentators, followed by Hosley (1984), Brown (1998), Craig (2000), Miller (2003), and Lenthall (2007), each of which take a different approach to the era.

There doesn't seem much more to be said. Baker (1981) surveys a once-common kind of radio programming—farm broadcasting. Halper (2001) provides a history, and Sies and Sies (2003) a directory, of women in radio.

Radio's entertainment programs have naturally attracted a wide following among historians, especially for OTR (old time radio—network programs up to about 1960). The standard reference work—and a readable one—is Dunning (1998). Given the import of radio music, it is surprising so little exists—see DeLong (1980) and Eberly (1982) for survey histories and Garay (1992) for a biography of Gordon McClendon, an important program innovator. Hilmes (1997) assesses three decades of network offerings. Hilmes and Loviglio (2002) provide a large anthology of programming and cultural studies. Squier (2003) adds a dozen more. Some individual programs have been subject to historical analysis, most notably the landmark *Amos 'n' Andy* comedy series studied in Ely (1991) and McLeod (2005). So has the work of radio comedians, notably in Wertheim (1979) and, more specifically, Taylor (1989) and Havig (1990) both writing about Fred Allen. Radio's playwrights have seen little attention save for Norman Corwin (see Bannerman, 1986). Heyer (2005) focuses on Orson Welles' radio work while Blue (2002) relates wartime drama to the post-war political blacklist. Assessing programming's impact, Loviglio (2005) uses drama, music and soap operas as examples. Smith (2007) provides a case study of Gertrude Berg's programs. Radio's charlatans and rabble rousers always attract attention. Father Coughlin, notable microphone hate monger of the 1930s, has been the subject of several books of which Marcus (1973) and Warren (2006) are the best. "Goat gland" quack John Brinkley figures in Lee (2002), and as one of three figures treated in Juhnke (2002). Doerksen (2005) surveys some odd local stations and the sometimes strange views they promoted.

### Impact and Regulation

Keith (2000) and Douglas (2004) both offer wide-ranging surveys of radio's content and impact on American life. Keith (2008) offers twenty studies of radio's impact among a variety of listening groups. Among his several earlier studies are those of native-American radio (1995), underground radio of the 1960s (1997), and all-night radio (2001). Hilliard and Keith (1999) examine the radical right on the air. Newman (1988), Williams (1998), Barlow (1999), Savage (1999), Ward (2004), and Sampson (2005) all provide different approaches to detail the growth of black-oriented radio. Religious radio growth and impact is traced in Hangen (2002), Lochte (2006), and Siegel and Siegel's (2008) study of Jews on the air. Johnson and Keith (2001) survey gay and lesbian radio.

Histories of U.S. government radio regulation, however, remain scarce. McChesney (1993) offers an early alternative view of the "accepted" story of policy development in the crucial period to 1934, while Benjamin (2001) focuses on freedom of the air concerns in the same era. Brinson (2004) surveys the FCC amidst the red scare of the 1940s–60s. Foust (2000) reviews the long history of clear channel stations, in an important analysis of spectrum policy. Hilliard and Keith (2005) trace the rise and fall of localism in radio and (2007) the legal imbroglio of indecent content.

### Global Radio

A growing literature on radio's global history has been published in French, German, and other languages, though little of book length has appeared in English. This is even true concerning European radio history, other than World War II propaganda. Tracey (1998), for example, details the arrival and impact of competition to European public service radio systems. Fortner (2005)

compares radio policies in Britain, the United States, and Canada through World War II. But such comparative historical work in radio is comparatively rare.

On the other hand, international radio propaganda, especially German efforts during World War II, has been extensively studied. Bergmeier and Lotz (1997) review the personalities and program themes in Nazi broadcasts. Soley (1989) assesses the role of the OSS and CIA in radio subversive propaganda. Matelski (1995) provides a solid history of Vatican Radio's unique status. Nelson (1997) surveys the Cold War history of Western broadcasts into Russia and Eastern Europe, while Heil (2003) provides the first full history of Voice of America, though there are many memoirs of Radio Free Europe and Radio Liberty. Woods (1992, 2000) provides by far the best technical history of international radio past and present, including efforts by smaller nations.

British radio histories are numerous, usually detailed and documented, and expanding, beginning with the landmark Briggs (1961–95) five-volume history of the BBC to 1974's inception of commercial radio competition. Intended for a set sadly never completed, Scannel and Cardiff (1991) provide a broad social history of the BBC's pre-war years. Avery (2006) reviews BBC high-brow programming under John Reith. Havers (2007) surveys what some feel were the BBC's finest hours when it covered World War II. Offering a technical research view of radio across the British Empire before the war, Anduaga (2009) describes important spectrum work done in several nations. Hendry (2007) reviews the shorter history (since 1967) of Radio Four. Street (2006a) assesses the BBC's commercial competition from Europe up to 1945 while Stoller (2010) places Independent (or commercial) domestic British radio in historical context since 1974.

Scholarly studies of radio in Canada began with Weir's (1965) analysis of developing a national system in a bilingual nation. Peers (1969) continued in a similar vein, though with more documentation as might be expected in a dissertation-based study. Vipond (1992) assesses the first decade of Canadian radio, while Hall (1997) traces Canada's international radio service since World War II. There have been many popular books on Canadian programs and personalities.

Radio's history in Latin America is also not well recorded, though we have numerous snapshot surveys from as early as the 1930s, now valuable historically. English-language studies are especially sparse. Fox (1997) briefly surveys the rise of broadcasting in eight Latin nations. Hayes (2000) discusses how radio helped develop a sense of nationhood in Mexico to 1950, while Claxton (2007) assesses radio's first quarter-century in Argentina. Schwoch (1990) and Howard (1986) both describe changing radio relationships between the United States and Latin nations.

English-language histories of Asian radio remain very limited. Japan's NHK has produced a number of English-language studies over four decades, the most recent example being Hisateru (2002), which draws on a massive Japanese language study. Other than the Middle East (for which see Boyd, 1999), there is little else available on Asia or Africa—indeed, African radio has barely been touched (for a start, however, see Head, 1994).

#### MISSING LINKS: WHAT WE STILL DON'T KNOW

Despite the gains of recent years, much historical work remains to be done. This brief section takes the American radio scene as an example—similar surveys of what is lacking could be made for most industrial nations (for a fuller assessment of missing American radio literature, see Sterling and Keith 2006). As an example of the larger problem—more than four decades after its appearance, American work still relies (or at least builds) upon Barnow (1966–70) as a benchmark despite availability of vastly increased archival resources and historical knowledge developed in the decades since.

#### Missing Persons

perhaps most appalling is the lack of documented studies of radio's many important inventors, though in many cases their vital papers survive. For example, we lack adequate studies of Marconi, de Forest, Armstrong, and Fessenden to cite just four. As important in explaining radio's role and development are the industry leaders for whom we have no adequate studies—CBS's Frank Stanton being chief among the U.S. network executives for whom we have little. Likewise, beyond Murrow, we have too few adequate biographies of important radio journalists. Nor do we have studies of important programmers (Top-40 innovator Todd Storz comes to mind) or station owners (George W. Trendle who helped create important programs and the Mutual network, the Yankee Network's John Shepard III, or Clear Channel's May family are examples). None of the important audience researchers, including Daniel Starch, Archibald Crossley, C. E. Hooper, or A. C. Nielsen (father and son) have been adequately studied. Charles Siepmann played an important role in the BBC in the 1930s and American FCC in the 1940s—but is almost forgotten. We lack studies of most pioneering women in radio—and as Halper (2001) has helped us to understand, there were many of them. We have little serious biographical work on FCC chairmen or commissioners, some of whom shaped the industry, nor do we have studies of parallel regulators elsewhere.

#### Lost Institutions

European work in important company history puts the American effort to shame, for we lack solid histories of most important U.S. manufacturers, national networks (with the partial exception of NBC for which documents are available), and other firms. Too many of the vital records have disappeared or are being overly-controlled by paranoid attorneys. RCA, the paramount American player in radio for decades, lacks a documented history. A critical history of the National Association of Broadcasters (which dates back to 1923) would shed much light on radio's development. So would even a partial history (say to 1970 or so) of the centrally important FCC. Few individual stations have adequate histories (though, to be frank, many don't deserve the attention!). Apart from the work of Fones-Wolf (2006) and Godfried (1997) and Godfried's chapter 18 of this volume, we know little about the role of unions in radio.

#### Forgotten Words

The literature of radio—in terms of its thousands of hours of drama, for example—has been poorly studied to date. Many important writers contributed to radio on both sides of the Atlantic, yet their efforts, with the exception of the revered Norman Corwin, are largely forgotten (as compared to books about even minor cinema figures, for example). Some script collections appeared decades ago, but little of analytic substance. Part of the problem is pulling out the quality material from the mass of dreck of day to day programming. Radio documentary is ignored in the historical literature, yet for a fairly brief period, such programs were important. What about presidential radio broadcasts, the earliest of which date to the 1920s and which are still being created? Most program formats originated on radio, not television, yet we have more studies of the latter.

#### Policy Black Holes

In addition to a lack of much historical work on the FCC (for one exception see Brinson 2004), nobody has yet assessed the role of Congress in developing radio policy—or the British Parliament



for another example. We have few studies of regulatory issues (Foust 2000 is one exception, as are Hilliard and Keith, 2005 and 2007), though some dragged through years of proceedings. The last serious study of government radio licensing appeared in 1950! The role of copyright entities (e.g., ASCAP, BMI) and issues has been historically ignored. Blacklisting studies focus on theater and film and say little about radio. Nor do we have adequate historical studies of the role of both British and American radio broadcasting as models for many other nations.

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