

4

The Phone and the Polity

The effects of the telephone on political organizations in some respects parallel its effects on economic organizations; both belong to the genus large organizations. But some phone effects are specific to politics.

4.1 The telephone system will foster national integration. (Type B)

As long distance telephony spread its reach over the nation, observers proclaimed that it meant “a final blow to sectionalism. . . . Had the telephone system reached its present perfection previous to 1861,” Arthur Pound argued in the semi-centennial volume on the phone system, “the Civil War would not have occurred.”¹ More commonly, writers have made similar statements about broadcasting which is said to have homogenized the popular culture, but the telephone too was seen as reducing sectionalism even before national broadcasting had become a major phenomenon.

4.1.1 The long distance telephone will reduce regional dialect differences. (Type B)

The most commonly cited indicator of national integration is the disappearance of sectional dialects.²

Edward J. Hall, president of the Southern Bell Telephone and Telegraph Company is quoted in two articles in *Telephony*. Each article says virtually the same thing: there are to be no more dialects—no southern, no northern, no western accent—but instead just “one harmonious American language”

spoken in exactly the same intonation throughout the length and breadth of the land . . . The Southern accent, too, is rapidly disappearing. There are many causes—the southerner travels more, he uses the language of commerce to-day . . . but, above all, looms the fact that long distance telephone is used so much more generally and frequently. The use of the

telephone, little as the casual onlooker may think of it, is bringing all normal voices to a sameness of pitch and engrafting a simplicity in enunciation.”³

To anyone who has followed the recent literature on radio and television as the alleged causes of the disappearance of regional accents and of the emergence of a standard national language, it is astonishing to find this same set of statements in 1906, and ascribed to the telephone. Given the tiny numbers of people who were making interregional telephone calls in 1906 (compared to the enormous number who were listening to radio 20 years later), it is hard to be persuaded of Mr. Hall’s causal attribution, yet the trend was taking place. The pace of interregional traffic and intercourse of all sorts had begun to pick up, and with it a process of national homogenization to which the telephone and later the radio each contributed.

4.2 A telephone system will foster growth in the scale of government administration. (Type B)

Just as the telephone fosters the growth of big business, so it also permits big government to function.

The first phones in Washington were set up when Congress appropriated \$150 in 1878 to connect the Public Printer’s office with the Capitol, to enable members of Congress to order extra copies of their speeches.⁴ A phone installed in the White House in the same year (during Rutherford B. Hayes’ administration) went largely unused.⁵

The telephone came into significant government use during the first two decades of this century. Writing in 1911, Herbert Casson notes,

Public officials, even in the United States, have been slow to change from the old-fashioned and more dignified use of written documents and uniformed messengers; but in the last ten years there has been a sweeping revolution in this respect . . . the new idea [use of the telephone] has already arrived in the more efficient departments of the Federal service.⁶

Presidents differed in their attitudes to the telephone. Presidents Cleveland and Harrison did not use the device much and only one instrument existed in the White House. President Garfield possessed a demonstration model while still a Congressman in 1878. William McKinley was the first who used the telephone extensively. He ran his 1896 Presidential campaign by telephone from Canton, Ohio, including listening to the proceedings of the Republican Convention in Chicago. A small switchboard was installed in the White House in 1901.

By 1910, Waldon Fawcett was able to report, in an article in *Telephony*, that “every Federal official, from the President to the humblest subordinate of the

nation's public servants, has a telephone on his desk." The phone systems at the capitol and the War Department and that of the Navy were ranked among the world's largest private exchanges, in number of phones and number of calls handled daily. By means of the vast telephone networks set up in the nation's capital, the President could communicate with the Secretaries of State, War, Navy, Interior, Agriculture, Treasury, Commerce, and Labor, with the Attorney General and the Postmaster General at their offices; in addition, he could reach, by means of direct tie lines to the Capitol, the President of the Senate or the Speaker of the House.⁷ However, in the following election the president chosen was Woodrow Wilson who, as we shall see later, disliked the phone and declined to use it. (cf. 4.5.2.) By 1931, when the new Department of Commerce Building was opened, it contained 1600 telephones carrying 10,000 calls a day.⁸

Franklin D. Roosevelt was probably the last president who did not make much use of the phone. In 1934, according to the log books at Hyde Park, about 200 persons a day called his phone, but he only actually talked on the phone about five times a day. If one visits the "Little White House" in Georgia, where he spent much of his last years and from which he ran the war effort, one will find only one phone and that in a basement room. Roosevelt preferred personal contact and written correspondence to telephoning. He built his political machine and national status by an enormous correspondence carried out by means of a team of writers under the leadership of Stephen Early. When he reached the White House this team was expanded to handle the vast flow of letters that he invited in his radio fireside chats.⁹ Roosevelt, however, was probably the last President to view the telephone with distaste. All his successors have been heavy users, and particularly Jack Kennedy and Jimmy Carter have been telecommunications enthusiasts.

As in the case of industrial organizations, the diametrically opposite consequences of centralization and decentralization, gigantism and democratization have been attributed to the growth in governmental telephony. And as in the case of industry both sets of assertions have some merit. The organization grew larger with the aid of the telephone, yet the duality of effects is illustrated by the fact that by allowing flexibility and informality the telephone prevented the bureaucratic giant from strangling itself.

4.2.1 The use of the telephone will centralize the exercise of authority. (Type B)

In section 3.1.3 we noted the proposition that long distance telephony (along with telegraphy) tended to reduce the authority of field office managers. Among examples that have been cited are the decline in the authority of ambassadors. A similar effect has been observed even within local or headquarters administration. The telephone permits the top official to intervene quickly and directly in any office of the organization and thus keep close personal touch.¹⁰

4.2.2 The use of the telephone will reduce the bureaucratic rigidity of administrative behavior. (Type B)

We can repeat the point made in the last paragraph to draw an apparently opposite conclusion. A chief executive who picks up the phone to talk informally to a subordinate several levels down the bureaucratic tree, or two subordinate officials from different branches of an organization talking informally to one another without informing their chiefs, are breaking the structure of bureaucratic authority. They are avoiding passing messages through the line of command. As Casson pointed out in the quotation above, they have changed from “the old-fashioned and more dignified use of written documents” which could be physically passed from hand to hand along the line of command. We note later an 1899 Supreme Court description of long distance government communication as “almost all, if not all, in writing.” (Section 4.3.1) However, the kind of bureaucratic formalism of communication that the Supreme Court noted broke down under the impact of the telephone’s convenience for direct person-to-person access.

4.2.3 The use of the telephone will reduce the keeping of written records. (Type B)¹¹

Given the vast proliferation of government files it is hard to believe that more could be in writing than is. But it could be. Everyone with experience in government can testify that many of the most important understandings are reached on the telephone, precisely to avoid the creation of a written file. Consequences of this for historians we shall note in section 11.3.2.

4.3 Legal effects of the telephone.

The courts had to take early note of telephones and of some novel problems they raised. Phone companies, like any large companies, were in the courts in many ordinary ways that we do not take account of here. These included patent suits, liability for damage from accidents, workman’s compensation, and contracts. We deal with the subject of regulation in a separate section (4.4.2). Here we note a number of novel legal issues that the telephone raised and how the courts handled them.

4.3.1 Courts subsume the telephone under established legal precedents, particularly those of telegraphy. (Type C)

The issue of whether the telephone was a telegraph under the law, and therefore governed by regulations over telegraphy, was resolved in the affirmative in Britain in 1880.¹² It was discussed in American Law journals promptly

thereafter.¹³ In 1887 the first of a series of similar decisions appeared in the U.S. courts.¹⁴ However, in one very important case the Supreme Court refused to follow that analogy. In *Richmond v. Southern Bell Telephone and Telegraph Co.* (174 US 761, 1899) the Court held that the provisions of the 1866 Post Roads Act allowing telegraph companies use of lumber and free right of way on public lands and along post roads did not apply to the telephone. The judge argued that in 1866 “nothing was then distinctly known of any device by which articulate speech could be electrically transmitted or received between different points more or less distant from each other.”¹⁵

The court then made the point that “Governmental communications to all distant points are almost all, if not all, in writing. The useful Government privileges which formed an important element in the legislation would be entirely inapplicable to telephone lines, by which oral communications only are transmitted. . . .”¹⁶

That decision deprived phone companies of some useful privileges, though the reverse British decision did them more harm in the British context by extending *de jure* the public monopoly status of the telegraph to the telephone; private telephone companies were allowed by the British Government to maintain a precarious existence until 1912, but they existed only on sufferance.

Despite the *Richmond* case, the general impulse of U.S. courts was to pretend that the phone was nothing new. Precedents from telegraphy and also from common carrier law were taken over into the telephone field.

4.3.2 The telephone raises problems in the law of evidence. (Type C)

Very early the question arose as to the admissibility in court of John Doe’s statement that Richard Roe had made some agreement with him during a telephone conversation.¹⁷ There was no doubt that oral agreements had standing in the law, but could Doe, when he only heard a telephonic voice and could not see Roe, be sure it was Roe who was talking to him. In 1885 the Supreme Court of Kentucky in *Sullivan v. Kuykendall* decided that acceptance of such testimony would be subversive of recognized rules of evidence.¹⁸ Other courts, however, soon recognized that:

The telephone although a very recent invention, has come into such common use that, we think . . . that the courts may properly take judicial notice of the general manner and extent to which it is made use of by the business community. No doubt very many important business transactions are every day made by telephonic communications of precisely the same character as that which the witness was allowed to testify in this case.¹⁹

The debate continued for a couple of decades²⁰ but ultimately the courts had

to adapt to the realities of the vast increase of telephone use in business, and perhaps were also reassured by improved fidelity in telephone reception.

4.3.3 The use of the telephone raises problems as to the liability of the phone company for losses attendant on telephone failures. (Type C)

Perhaps discussion of this proposition does not belong here, for the basic principle had already been established in telegraph law that the carrier if not grossly negligent was liable only for the value of the undelivered physical message, not for the value of the information contained in it. In contrast to transportation common carriers who could be held liable for the value of the lost or damaged cargo, the message carrier moved something that had no obvious intrinsic value that the carrier could recognize. The carrier could not be expected to assume a potentially unlimited liability for whatever value some information might have to its users in unknown circumstances.

While there was that telegraphic precedent, the telephone entered into American life in such a full way that numerous cases were nonetheless brought, making such claims. A child died without benefit of a physician when the phone failed to work; businesses lost money when their customers could not reach them or when they were mislisted in the phone book. Between 1881 and 1902 courts of 25 states made rulings that removed telephone companies from possible suits under the mental anguish doctrine. The cases on liability were reviewed by Brutus Clay in 1914; he presents arguments, similar to those in the telegraph case cited above.²¹ For those reasons the courts generally declined to hold phone companies liable for all the consequences of a failure of service.

4.3.4 Telephonic communication suffers a diminished First Amendment protection compared to earlier means of communication. (Type C)

The traditional domain to which the principles of the First Amendment have been applied are face-to-face meetings and private publishing. Electrical communication systems that require the stringing of wires across public and private lands and that are conducted by local monopolies have not been treated by the courts as subject to the same exemption from government regulation. For example, the Supreme Court has thrown out special taxes on newspapers as unconstitutional; it allows taxes on telephone bills.

Denial of the telephone to a subscriber for having used bad language goes back to 1885. Denial of a printing press to a publisher because of the obscenity of previous publications would be unconstitutional prior restraint under the doctrine of *Near v. Minnesota*.²²

Pugh v. City and Suburban Tel. Co., 9 Bull 104, held that "if indecent or rude or improper language was permitted, evil and ill-disposed persons would have

it in their power to use it as a medium of insult to others, and perchance by some accident, such as the crossing of wires, or by a species of induction, the same communication might be launched into the midst of some family circle under very mortifying circumstances.”²³

The Communications Act of 1934 forbids telephoning any comment, request, suggestion, or proposal which is obscene, lewd, lascivious, filthy, or indecent.

4.4 Regulation and monopoly.

4.4.1 The telephone system attests to the efficiency of certain kinds of monopoly. (Type B)

The general American ideology and legal tradition is against monopoly. During the first two decades of the century, when the independents were trying to establish themselves in the telephone field, numerous diatribes against the Bell monopoly were published. One pamphlet, Paul Latzke's *A Fight With An Octopus*²⁴ was printed in the millions of copies.

Nonetheless, the advantages of an interconnected grand system were conspicuous and lent support to the theory of natural monopoly. The 1920s were a time when various doctrines of planning were being disseminated both in the U.S. and in Europe. They affirmed the efficiency of large scale scientific management. The argument in favor of planning cut across the then much more hotly debated issue of public vs. private ownership. Proponents of planning and large scale management were to be found in the early 20th century on both sides of the socialist-capitalist debate. The telephone system was often cited as an example of how a well managed giant monopoly could be efficient and meet public needs.²⁵

4.4.2 A privately owned telephone system will be subjected to government regulation. (Type C)

Vail recognized that a corollary of being allowed to have a private monopoly was acceptance of government regulation. He did not fight it; he encouraged it. “The public . . . has begun to appreciate and believe that the telephone service is a natural monopoly; that any telephone exchange must have universal service—from every exchange and every subscriber as a centre in every direction to the farthest talking limits; that one telephone system is sufficient, and more than one a nuisance.”²⁶

Vail saw regulation as a means to the creation of a single unified system. “Far from opposing public supervision and control,” wrote Sydney Brooks in 1912, Vail “welcomes it. He insists that just as ‘corporate organizations and combinations have become a permanent part of our business machinery,’ so public control or regulation of public-service corporations by quasi-judicial commissions has become a permanent part of our political machinery.”²⁷ “State control or

regulation" Vail said "should be of such a character as to encourage the highest possible standard in plant, the utmost extension of facilities, the highest efficiency in service, rigid economy in operation and to that end should allow rates that will warrant the highest wages for the certainty of return on investment."²⁸

The regulation of telephony was only part of a general movement in the first four decades of the century for public control over public utilities and natural monopolies, but the large growth of the Bell System was an important stimulus to that movement. And, as with radio broadcasters later, the industry's encouragement of the process was a major factor in bringing about regulation.

4.5 The telephone in politics.

It is time for someone to write a book, or at least an article, on "The Telephone in Politics." The telephone alone has made it possible for one man to manage a campaign over an entire city. It has curtailed the functions and responsibilities of a district manager as the cable has those of an ambassador. It enables a canvass to be made, or a list of distinguished signatures secured for some "call" or manifesto, without the expenditure of several days' time or the employment of a large corps of workers.²⁹

Those words appeared in *Telephony* magazine in 1906. It is still true that no comprehensive study of the telephone in politics has been published.

Implicit in the 1906 statement was a focus on a particular use of the telephone in politics (one of three we shall note here), namely the use of the telephone to manage political organizations and campaigns. It also came later to be used for mass campaigning and for sustenance of political machines.

4.5.1 The telephone will facilitate central management of political organizations and campaigns. (Type B)

The first national election in which the telephone played an important role was McKinley's "Front Porch" campaign of 1896. During the Republican St. Louis convention that year, Speaker of the House Reed tried constantly, but in vain, to talk by phone to his friends at the convention. McKinley, however, succeeded in maintaining close communication with the convention hall from his home in Canton, Ohio which was "looped like a Christmas package with important coils of wire" for both telegraph and telephone. A call was placed from the phone booth near the hall when his name was put in nomination, but the connection seemed to be disturbed by "a curious distant hum, which turned out to be the roar of the demonstration six hundred miles away." Throughout the campaign McKinley maintained contact with his organizers by telephone.³⁰

In 1904 the plans for the Democratic national convention, also in St. Louis,

provided for a 100 phone network in the hall among state delegations, to the rostrum, and to the newspapermen.³¹

By 1910 use of the telephone had moved out onto the campaign trail. One writer on the California gubernatorial election that year, commented, "In a political campaign the telephone is indispensable. Even candidates are not more necessary for a good lively campaign. . . . The work must be done, so (the candidate) must rely on the telephone."

4.5.2 The telephone when widely diffused will be useful for reaching voters. (Type A)

If the phone was used at the turn of the century by politicians to keep in touch with each other, it was not more than a decade later that there were enough phones around to justify trying to influence voters by a telephone canvass. In 1908 in Atlanta a bank of 45 phones and operators was set up in a store, and voters who were pledged to a mayoralty candidate were phoned and urged to vote.³² In 1911, a phone company executive in Jefferson City, Missouri, organized such a telephone turnout drive for a municipal bond issue, using a bank of 25 phones and operators.³³

Before radio came on the scene, there were many suggestions for using the telephone network as a broadcast medium.³⁴ (These will be discussed in section 4.7 on the telephone and the mass media.) For example, in 1913 Woodrow Wilson addressed a dinner in New York by long-distance telephone, and thereafter was inundated with requests for similar speeches. Wilson, however, found that he disliked the phone, and in 1914 sent a letter announcing that he would make no more long-distance speeches. He also instructed the White House operators never to ring him.

If Wilson's rejection of the phone as an instrument of mass communication was partly a matter of personal psychology, the general failure of the phone to be used that way was not. After the mid-1920s there was simply a much cheaper way of doing the same thing, namely radio. Both before then and afterwards, the key fact was that the phone system had not been designed for one-to-many calls, which campaigns need. One-to-one canvassing is indeed used in campaigns but requires much more manpower than does mass communication. The topic of canvassing is one to which we shall return in section 4.6., but canvassing can rarely reach as many voters as cheaply as a true mass medium.

4.5.3 Telephone utilities in cities lend sustenance to political machines. (Type C)

A third political effect of the telephone has by now been largely forgotten. At the end of the 19th century and still in the first years of the 20th century most large American cities were run by graft-ridden political machines. Public utilities of all sorts were their easiest prey. No trolley system, or electric company, or

phone company can run without benefit of municipal franchises, permits to dig up streets, and other cooperation from the city government. Thus every new utility that came onto the scene presented a fresh set of opportunities to the political machines. They could demand jobs, side payments, and other favors in return for their favors. Needless to say, many of these relationships are not documented. Some few are. An article in the *Arena* reports on the padding on the payroll by New England Telephone.³⁵ "Mr. George Dresser," superintendent of construction for NETCO, ". . . admitted that the company had during the last half of 1906 employed ten per cent of their men in the underground construction department who had not rendered services equivalent to their wages and who got on the payroll through political or other influence, . . ." Such deals were what created and sustained the urban political machines of that day.

4.6 Polling, canvassing and fund raising will be easier by phone. (Type A)

The existence of a telephone network with high levels of penetration provides a sampling frame and also a medium for conducting population surveys.

We have already noted the occurrence of telephone political canvassing starting in 1908. The same idea of using the telephone to reach a large sample of the population occurred to people in various fields such as marketing, advertising, research, and religion. In the same year the Chicago Christian Endeavor Union announced a plan to save 100,000 souls within one year by phoning lists of unconverted friends of members.³⁶

We noted earlier (2.1.7.2) that in the early years of city planning the telephone company was the best source of data on urban population and demographic trends. The fundamental plans that phone companies drew up were based upon detailed neighborhood information. That information was obtained in part by telephone polls conducted by the operators. Hubbard and Hubbard³⁷ describe the Los Angeles procedure in which "a battery of telephone girls called everyone in the city."

In the process of conducting and perfecting such research methods, AT&T became a center of sampling theory. If they carried theory into practice they should have realized, however, the fallibility of samples drawn from telephone directories (convenient as they were) at any period before the 1950s. The *Literary Digest* learned that lesson the hard way. The mailing lists for its 1936 questionnaires on the Roosevelt-Landon election were drawn partly from phone books, which had by then become the main directories in the U.S. But phone subscribers were still an affluent subset of the population. It was partly that bias which led the *Digest* to obtain a Republican majority in its poll in that Democratic landslide year.

By now, in the United States telephone canvassing is used by pollsters, politicians, market researchers, advertisers, and salesmen. It is feasible because in the U.S. most people are not offended and are cooperative when a stranger phones on legitimate business, even the business of promotion. In many countries of the

world that kind of approach would be impossible because such an unsolicited promotional call would arouse indignation, not cooperation.

Indeed, with the coming of automatic dialers and tape records, resistance to canvassing is growing in the United States. Automatic canvassing machines were starting to burgeon until the advertisers and others who used them discovered strong opposition to them. Indeed a petition was filed with the FCC to ban or regulate such devices. The FCC in 1980 ultimately declined to do so, partly on free speech grounds. It was not clear how to draw an effective line between abuse and proper use of the network. So telephone canvassing continues to grow, limited only by public non-cooperation.

4.7 The telephone and the mass media.

Under this heading we consider two related matters: the use of the telephone itself as a mass medium, and the use of the telephone by other mass media.

4.7.1 The telephone will (will not) be a means of mass communication. (Type A)

When the telephone was first invented, implicit in the thinking of its promoters were two not wholly compatible theories about its prospective use. One assumption was that the telephone would be used for person-to-person conversations, the other that it would be used as an instrument of mass communication, delivering news, music, entertainment, and information to subscribers. To cite a few early examples of expectations of broadcasting use of the telephone: The *Springfield Republican* observed on February 15, 1877:

Again, by an instrument skillfully arranged, all the music of a prima donna could be distributed over the country while she was singing, thus popularizing good music to an extent as yet unknown. The Metropolitan newspapers could employ persons to read their articles to subscribers in distant parts . . . Wonderful are the achievements of science, by which the filing of a saw, or the flute playing of an amateur, may be heard round the world like the morning drumbeat of the British army, or the shot fired at Concord Bridge.

In an interview with the *New York Sun* printed five days later, Watson, Bell's assistant, stated that he hadn't the slightest doubt that in a few months a man could lecture in Boston and be heard by an audience in any part of the country. Sidney Aronson describes how for a few a few months Bell himself was initially unsure about this.³⁸ He then adopted the point-to-point conception described in his 1878 letter.³⁹ Others persisted for a long time in proposing or experimenting with what Asa Briggs calls "The Pleasure Telephone."⁴⁰ In Budapest a service operated from 1893 until after World War I, using a for-

mula much like that of radio today, delivering news, music, financial information, and announcements to subscribers. About 1912 an unsuccessful service of the same sort was established in Newark, New Jersey.⁴¹

There were various reasons why “the pleasure telephone” failed to take hold. The fidelity of early telephones was poor, but so was the fidelity of early radios and phonographs, so that is not explanation enough. The novelty of these devices overcame any critical perfectionism on the part of the customers. Furthermore, if the demand had existed, the phone system could have been developed toward higher quality sound. That would have been costly, however. High power transmission would have been required so as to override electrical interference and that would have raised the cost of phone service still higher. As it was the telephone was too costly to succeed as a mass medium; that was the determining factor. Two hundred dollars a year at the turn of the century was a feasible payment for a business or a wealthy person. It was not a feasible payment for a worker earning \$38.50 a month. (cf, Section 1.1.2). Before electronic distribution of mass communication succeeded (as it did in the 1920s), a device had to be invented that cost the ultimate listener only a fraction of that, even at the higher living standard of two decades later. The radio achieved that cost breakthrough by dispensing with the investment in the wired network. Before radio became economically viable, however, the vacuum tube had to be perfected to the point where the large expensive batteries in early sets could be replaced by wall current.

Part of the economic foundation of most mass communications is advertising. For that revenue to flow there must be enough audience so advertisers will pay their share. It is a chicken/egg problem; the audience must be there to win the advertisers; the ads must be there to serve the medium to the audience. In the case of the introduction of television that dilemma was met by a massive initial investment (mostly by RCA) around 1950. Minimal TV broadcasting had existed since the 1930s, but before the public at large would buy sets, there had to be good programming, and before there could be good programming there had to be sponsors, and before there could be advertising sponsors there had to be mass audience. The log jam was broken fifteen years after TV was technically available, by massive simultaneous investment in broadcasting, software, and promotion of sets, at a vast initial deficit. When that investment was made the country was covered by TV in about four years between 1950 and 1954. If the phone system had had to be introduced in that way there would have been a delay of decades. The problem the phone promoters faced in the 1870s was to find potential users of the new device who would get value from it, even when linked to only one or a few other sets. Businesses or professional people who had to maintain regular communication among limited operating points were thus the natural clients. Starting with initial subscribers to such “intercoms,” the phone system could grow gradually and incrementally. The economics thus favored a point-to-point phone system, not a telephonic mass medium.

4.7.2 Use of the telephone by other media.

4.7.2.1 The telephone will speed reporting. (Type A)

In 1880 the *London Times* ran a telephone from the House of Commons to their newspaper office so as to gain half to three quarters of an hour of extra time in reporting late night debates for the morning edition.⁴²

The first use of the telephone by a journalist was for a report to the *Boston Globe* of a speech by Graham Bell in Salem, Massachusetts on February 12, 1877. The press was already one of the main users of telegraphy, which had enormously accelerated distribution. It was natural for the press to see the advantage of a medium which permitted a reporter to send in a story without having to carry it in to the telegraph office where the telegrapher would tap it out in Morse code, for another telegrapher to retranslate it back into English at the other end of the line, where it would be handed to a messenger boy for delivery to the newspaper. Reporters had had substantial difficulties with telegraph companies. The most important of these difficulties are not fully relevant here; there had been a struggle between Associated Press and some telegraph companies for control of the function of press wire services. But even on a day-to-day basis there were problems; reporters raced for priority at the telegrapher bottleneck. At an event being covered by many competing papers, the reporters would race to get to the telegrapher first, and indeed sometimes resort to such tricks as tying him up with long messages to delay other reporters. Getting to a phone solved that kind of problem.

Getting to a phone, however, was not always easy in the early days. Phones were not pervasive. One of the problems of a reporter in the field was to find the nearest subscriber and somehow talk or bluff his way into permission to use the phone.⁴³ In the end, as public call boxes and other phones became widespread, the phone made it possible for papers to get the news from the field almost instantaneously.

4.7.2.2 The telephone changes the relationship of the reporter and editor. (Type B)

It was commonly observed after the telephone had become a commonplace in journalism that it sharpened the division of labor between reporter and editor. The reporter, it was noted, might now stay on his beat and go for weeks without ever coming into the newspaper office. He would phone his stories in to the editor, who would handle them from there on.⁴⁴

4.7.2.3 The telephone system will link network radio broadcasting stations. (Type A)⁴⁵

It was recognized from the beginning of experiments in radio broadcasting,

shortly after 1920, that telephone lines could be used to link geographically dispersed transmitters so as to give wider coverage to broadcasts.

This capability was important to the phone company as a source of new business, and also to the broadcasters so each station would not have to create all of its own programs, and it also made broadcasting more attractive to national advertisers.

It turned out that this possibility of networking became the key to resolving a struggle between RCA and AT&T for control of the new medium of radio. The phone company saw radio transmission as a natural extension of telephony, and sought to extend its monopoly into that area too. AT&T developed a plan whereby it would build a transmitter in every community, and make it available for a charge to community institutions for broadcasting; AT&T had no intention of getting into the software field. As an experiment it established WEAJ in New York City in 1921. We have already quoted AT&T President Griswold's 1922 assessment, saying if that experiment was commercially successful stations would be networked by a long lines plant. However, RCA also aspired to dominate broadcasting and had many of the key patents. The outcome was an agreement in which AT&T left the field of broadcasting in return for RCA's commitment to use AT&T lines for networking (i.e., not Western Union's), and the companies agreed on patent licensing between them.

4.7.2.3.1 Networking of broadcasting stations will, in turn, have many social effects. (Type B)

By permitting radio networking, the telephone system has contributed to many of the social effects of national radio (and later TV) such as presidential leadership, national integration, rapid fads, etc.

The first dramatic evidence of the importance of networking was when President Harding died in 1923. Calvin Coolidge's eulogy was carried across the nation by long distance telephone lines to the broadcast stations and thus to an audience of millions. *Telephony* predicted that "this event will mark the broadcasting of presidential messages and addresses over radio as a common feature."⁴⁶ Indeed, network radio did lead to just such a growth of presidential power, particularly with Franklin Roosevelt's fireside chats.

But perhaps we are casting our net too widely if we start listing as effects of the telephone all those effects of broadcasting which depend on having a national network. This multi-step process of inference could be continued *ad infinitum*. and produce another book on technology assessment of broadcasting. We will not do that, but will cut the chain of inference here with just the one illustrative example of growth of direct presidential influence. Let us here just note that despite the commitment of Congress to localism in broadcasting (expressed in the Communications Act), thanks to networking we have a national system of broadcasting, with whatever consequences this has had for such matters as national integration or the rapid diffusion of fads and fashions through the media.

4.7.2.4 A result of the failure of the phone company to get control of broadcasting is a technically unsophisticated broadcasting system. (Type A)

One can ask the question, what would have happened if AT&T had been somewhat more aggressive in the research field in the first decade of the century, and had dominated RCA's patent position, and thus been able to implement its broadcasting plan? At least two possible paths of development suggest themselves. One possibility is that the government would not have tolerated AT&T's growing monopoly position and would either have nationalized the system (giving us a state run broadcasting system as in Europe) or broken it up. Alternatively, if the government had allowed AT&T to carry out its plan, there would probably be a broadcasting system quite unlike any in the world today.

Today, phone systems are usually dominated by engineers, but in broadcasting organizations engineers play a rather lowly role. The top positions in commercial broadcasting systems are held by people from either the programming or marketing side, and in government systems by civil servants and producers. The AT&T plan would, however, have made transmission the heart of the business. Since revenue would depend on leasing as much air time as possible, the broadcasters would probably have developed a system with much more efficient use of the spectrum to maximize the number of available broadcast channels, and a pricing scheme allowing for market segmentation so that special interest broadcasters could buy air time without unduly lowering the rates charged to mass broadcasters. If broadcast transmission were placed under rate of return regulation, there would be all the more incentive to invest large amounts in transmission plant to create a high quality and very efficient broadcasting plant. The engineers in charge certainly could have advanced the art far beyond what has been achieved today. On the other hand, the extraordinary development of American programming to maximize mass appeal might have been somewhat less advanced. The present system is designed to maximize the number of people listening and watching, not the number of broadcasters. A common carrier system would be designed to maximize the number of broadcasters, not the number in the audience. Thus there were significant social consequences to the particular outcome of the RCA-AT&T competition.

4.7.2.5 The telephone system will allow feedback for radio talk shows. (Type A)

Another relationship between the telephone and radio is that the telephone network could be used for feedback from the broadcast audience to the head end of the broadcast system. Thus for some kinds of programming such as talk shows or game shows there could be broadcast transmission downstream with the phone system being used for the upstream return. This kind of programming began early in the 1920s and has grown ever since.

4.8 The telephone system will democratize society. (Type C)

Starting in the 1920s, a contrast was sometimes drawn between mass media (such as broadcasting), which had a tendency to impose authoritative and uniform thinking on society, and the effects of the telephone which lent itself to the spontaneous interaction of individuals. Pound, in his 50th anniversary volume on the telephone said, "Radio broadcasting extends the reach of the public man enormously, but it cannot extend equally the reach of the private citizen. . . . That is why radio's social effects may be justly described as mass efforts, . . . while more intimate means of communication plow their way into the social life, breaking the crust of custom and stimulating new adjustments in every relationship of life."⁴⁷ Dilts in 1941 made note of the fact that Hitler had stopped telephone development in Germany by imposing large taxes.⁴⁸

Colin Cherry, Henry Boettinger, and Charles Perry have more recently picked up this theme.⁴⁹ Boettinger notes a Stalin quotation of how subversive a telephone system would be to the Soviet system. Cherry stresses the importance of the switchboard in making the telephone system an instrument of democratization. One-to-one or small group intercom systems without switchboards could have provided communication for elite groups. A switched network allows anyone to call anyone. In Section 7.2.1.2.3 we shall note that as telephone penetration grew, use changed from that of a hierarchic device for command to that of an instrument for interactive conversation.

The capacity of the telephone system to allow important people to be called by anyone was viewed in the early days of the telephone as one of its disadvantages, as Perry notes, particularly in England. He quotes A. H. Hastie, leader of the Association for Protection of Telephone Subscribers, commenting in 1898 about complaints of subscribers at being called on trivial matters. "A man might as well complain that he has to open his door to see unwelcome visitors." Hastie's answer was: "The telephone should be primarily answered by a servant" to screen intrusions.⁵⁰ It has often been observed that people answer the imperious ring of the phone will talk to people who whom they would not give an appointment. Boettinger and Cherry give some amusing examples including a man in the 1930s who made a hobby of a calling long distance to heads of states.

4.9 The telephone in international relations.

4.9.1 The telephone system will become a global one. (Type A)

This proposition is a simple extension of Section 1.3's forecast that long distance service would be provided. The first international line went from Paris to Brussels in 1887 and was extended the same year to Amsterdam. For such short distances, however, the international boundary is a technical irrelevancy; if long distance transmission was possible it was clearly possible there. The only issue was

whether there was some limit to the length of circuit, short of the circumference of the world. Underwater transmission difficulties might set one such limit, though there was the model of the undersea telegraph cable. In 1891 a Dover-Calais voice cable was laid.

Very long distances however, were only gradually conquered. Local exchanges that would be the basis for a global long-lines system spread rapidly around the world. By the early 1880s there were telephones in service in Cairo, Capetown, Calcutta, Bombay, Rangoon, Colombo, Shanghai, Honolulu, and Buenos Aires.⁵¹ But as we have seen in Section 1.3, until after 1900 the capacity to transmit very long distances did not exist. The Pupin coil, the Marconi experiments with radio, and the De Forest vacuum tube in 1907, along with other inventions, made the difference. By 1915 commercial land line service was opened up from coast to coast in the United States, and experimental radio-telephone calls had been made to Paris and Honolulu. Commercial service from the U.S. to Europe was opened in 1927, from Berlin to Argentina in 1928, from U.S. to Japan in 1934.

While after the turn of the century no one doubted that there would ultimately be a global system, the actual evolution of international lines was often slowed by lack of political incentives for extending lines across frontiers. When the U.S. Signal Corps arrived in Europe in 1917 it found no direct line between Marseilles and London or between Paris and Rome; it installed them.

4.9.2 International telephony will be important in diplomacy. (Type A)

“World-wide facilities for conversation must affect profoundly the relationship of states and peoples.”⁵² An early dramatic illustration of how important the telephone was to become in international diplomacy was its use at the Washington Conference of 1922. As a promotional effort to get world attention for the conference and to help it succeed, the United States provided unprecedented phone facilities (which, incidentally, left a deep impression on delegates who came from countries where the phone system did not work well). Private lines connected the Navy Building, where the conference was being held, with Conference offices, the Pan American Building, and various foreign embassies. There were over two hundred such lines for the sole use of the conferees. In a city which normally handled 350,000 calls per day, more than 420,000 telephone calls were put through during one record-breaking day of the Conference. The State Department provided the press with free phone service and with special cable connections with the result that the Disarmament Conference got the most complete coverage ever for such an event.

4.9.3 International telephony will favor summitry in diplomacy and reduce the autonomy of ambassadors. (Type B)

Earlier we have noted the tendency of top executives to use the telephone to

maintain direct control over what is happening in the field, with resulting reduction of the power of field managers not only in diplomacy, but also in banking and industry (Section 3.1.3). Heads of government or ministers of foreign affairs began phoning their ambassadors in the field with increasingly detailed instructions, and they also started bypassing them entirely, phoning instead to the ministers of foreign affairs or heads of government in other countries, at least in critical circumstances.

In the spring of 1931 world economic conditions had deteriorated to a crisis level. The German government was ready to default on its loans from U.S. banks. After having decided on a moratorium on all war debts as the wisest course of action—a decision reached only after lengthy phone conversations with over thirty leading members of Congress—President Hoover faced the challenge of placating the French government. Because of the urgency of the situation, the President had not even consulted with the French before announcing the planned moratorium on June 21, 1931. The French were outraged upon hearing of Hoover's decision. It was at this point that long-distance telephone diplomacy was used.

According to Hoover's memoirs:

During this period and subsequent weeks, I was in hourly touch with our representatives in London, Paris, Berlin, and Vienna by transatlantic telephone, and they were in similar close touch with one another. It was the first time that such extensive use had been made of the telephone by our government officials. . . and the telephone afforded far better understanding and much quicker contact than were possible with the slow coding and decoding of formally phrased cables.⁵³

The calls were effective, and on July 6, an agreement was signed with the French; but not before having aroused a certain amount of furor in other parts of the world. A June 29 headline in *The New York Times* read, "Phone Diplomacy Arouses Belgians," and the ensuing story read, in part, as follows:

Belgian politicians are working overtime this weekend on an answer to President Hoover. It transpires that European diplomacy has been abruptly awakened from a centuries-long sleep during the past week by urgent telephone calls from Washington.

Quickly, politicians have realized President Hoover was listening in.

This breach of diplomatic precedent has startled Europe, a Belgian politician declared, relating how Europe was being hustled by new American methods. It is a new world without distances, he said, which makes diplomats feel they have outlived their usefulness when the heads of States can discuss matters almost face to face."⁵⁴

4.9.4 International telephony will foster world peace. (Type B)

In hindsight one can be cynical about this prediction in its more unqualified forms, but in the long run it may turn out that growth of international communication may be a force in that direction. It is easy, however, to find assertions of a fantastically optimistic kind. The same sorts of statements were made about the international cable, long before the telephone. When President Buchanan and Queen Victoria exchanged congratulatory messages by cable in 1858, a newspaper wrote:

Tomorrow the hearts of the civilized world will beat in a single pulse, and from that time forth forevermore the continental divisions of the earth will, in a measure, lose those conditions of time and distance which now mark their relations.⁵⁵

A poet wrote:

Lo the golden age is come!
 Light has broken o'er the world.
 Let the cannon-mouth be dumb,
 Let the battle-flag be furled;
 God has sent me to the nations
 To unite them, that each man
 Of all future generations
 May be cosmopolitan.⁵⁶

In similar vein some decades later Gen. Carty wrote:

Some day we will build up a world telephone system making necessary to all peoples the use of a common language, or common understanding of languages, which will join all the people of the earth into one brotherhood.

There will be heard, throughout the earth, a great voice coming out of the ether, which will proclaim, "Peace on earth, good will towards men."⁵⁷

4.10 The telephone and warfare.

Whether or not the telephone helped prevent war, it was certainly useful in conducting it.

4.10.1 The telephone will be useful for command and control. (Type A)

The war in which field telephones first made their mark was the

Russo-Japanese War of 1905. Casson describes how the Japanese troops in a crescent 100 miles long moved forward stringing telephone wires behind them, running from each regiment and battery to divisional headquarters. The fifteen divisional headquarters were wired to three group headquarters, and these were wired in turn to General Oyama who sat ten miles behind the line and sent his orders. The Japanese victory was attributed to this communication feat.⁵⁸

The idea may have come to the Japanese by observing the Boxer Rebellion of 1900. The Western troops marching from Tientsin to Peking strung telephone wire behind them. After the suppression of the rebellion that wire was left in place, providing the first telephone service for China outside of Shanghai.

4.10.2 The telephone encourages centralization of command at higher echelons. (Type B)

This is the same phenomenon that we have already observed with regard to bankers, industrialists and ambassadors (cf Sections 4.9.3, 3.1.3). The example of General Oyama just cited serves to make the point.⁵⁹

FOOTNOTES

¹ Pound. *The Telephone Idea*, p.25.

² Pound. *The Telephone Idea*, p. 25.

³ The Telephone Voice, *Telephony* 6, June, 1906, 11 (6), 382.

⁴ Frank Hall Childs. When the Telephone Was Young in Washington, D.C., *Telephony*, April 1, 1933, 104 (13) 17.

⁵ Kenneth E. Davison. *The Presidency of Rutherford B. Hayes*. Westport, Conn.: Greenwood Press, 1972, p. 171.

⁶ Casson. "The Social Value of the Telephone," p. 899.

⁷ Walden Fawcett. How Uncle Sam Uses the Telephone, *Telephony*, Jan. 22, 1910, 18 (4), 89-90; *Telephone Engineer*, Vol. 5, No. 6 June 1911, p. 319.

⁸ Telephones in Big Government Building, *Telephony*, Vol. , No. Jan. 23, 1932, 102 (4) p. 18.

⁹ Leila Sussman. *Dear F.D.R.* Bedminster Press, Totowa, NJ (1963).

¹⁰ The Telephone in Politics, *Telephony*, Dec. 1906, 12 (6), 364.

¹¹ Cf. sections 10.5 and 11.3.

¹² Attorney General v. Edison Telephone Co. 6 O.B. Div. 244.

¹³ Anon. 10 *Central Law Journal* 178 (1880); William G. Whipple, 22 *Central Law Journal* 33 (1886); W.W. Thornton, 33 *Am. Law Register* 327 (1886); Herbert Kellog, 4 *Yale Law Journal* 223 (1884).

¹⁴ Chesapeake and Potomac Telephone Co. v. Baltimore and Ohio Telegraph Co., 66 Md. 339.

¹⁵ Richmond v. Southern Bell Telephone and Telegraph Co., 174 US 761, 1899.

¹⁶ *Ibid.*

¹⁷ Cf. quotation in section 1.4.3.5.

- ¹⁸ *American Law Review* 1885, 33, 448.
- ¹⁹ *Globe Printing Co. v. Stahl* 23 Mo. App. 451, 458, 1886.
- ²⁰ E.g., *Bank of Yolo v. Sperry Flour Co.*, 141 Cal. 314, 1903; *Young v. Seattle Transfer Co.* 33 Wash. 225, 1903.
- ²¹ Brutus Clay. *Virginia Law Review* 337–360. Feb. 1914, Vol. I, No. 5 “The liability of a Telephone Company for Its Negligent Failure to Furnish Promptly Service for Summoning a Physician in Case of Sickness”.
- ²² 283 US 697, LEd 1357, 51 S Ct 625.
- ²³ Cf. William H. Rockel. “The Law Relating to Telephones” *American Law Register*, Feb. 1899, 12, 73 *Huffman v. March Mutual Tel. Co.*, 143 Iowa 590, 1909.
- ²⁴ Paul Latzke. *A Fight with an Octopus*. Chicago: The Telephony Publishing Co., 1906.
- ²⁵ Cf. Brooks. *The Politics of American Business*, pp. 708–720.
- ²⁶ *Public Utilities and Public Policies*, p. 318.
- ²⁷ Brooks. *The Politics of American Business*, p. 715. Cf. *The Telephone and Government Regulation*, *The Outlook*, 1908, 846–47; Casson, “The Future of the Telephone.”
- ²⁸ Vail. *Public Utilities and Public Policies*, p. 318.
- ²⁹ Telephone in Politics, *Telephony*, December 1906, 12 (6), 364.
- ³⁰ *The New York Times*, June 17, 1896. p. 2; H. Wayne Morgan, *William McKinley and His America*. Syracuse: Syracuse University Press, 1963, p. 218; Margaret Leech, *In the Days of Mckinley*. New York: Harper & Brothers, 1959, pp. 81–82.
- ³¹ “Democratic National Convention will Be Conducted By Telephone, *Telephony*, May 1904, 1 (5), 345.; Programme of Convention, Part 1 *The New York Times*, July 6, 1904, p. 1; Telephones At A Convention *Telephony*, Vol. 8, No. 1, July 1904, 8 (1), 34. on reaching newsmen see also *The Telephone in The Political Campaign in Oklahoma*, *Telephony*, Oct. 24, 1908, 16 (11), 424.
- ³² Telephone Aids in a Local Election, *Telephony*, April 24, 1909, 12 (17), p. 493. In Des Moines, Iowa, earlier in the same year a bipartisan turnout drive was organized with the cooperation of the local phone company (Telephone Help Election Day *Telephony*, June 1908, 15 (6), 373–74). In Kansas in the same year phone calls were made to attract audiences to political speeches (Using the Telephone in Kansas for Political Purposes *Telephony*, Oct. 3, 1908, 16 (8), 324). As early as 1905 it was suggested that the telephone could be used to quell rumors (Bergengren, *The Far Flung Telephone*, pp. 65–71.)
- ³³ Percy G. Robinson, Campaigning by Wire, *Telephony*, Nov. 26, 1910, 59 (22), 625; *Telephony*, May 1904, 7 (5), 347; Warren H. James, A Telephonic Canvas for Votes, *Telephone Engineer*, Vol. 6 No. 5 Nov. 1911, pp. 257–8.
- ³⁴ For example, playing a record of a campaign speech over the telephone (*Telephony*, Oct. 3, 1908, 16 (8), 338–39).
- ³⁵ The Phantom Labor Brigade; or How the New England Telephone and Telegraph Company Squanders the people’s Money to Control the political Situation, *Arena*, September, 1907, 38, 329–31.
- ³⁶ Saving Souls By Telephone, *Telephony*, July 1, 1911, 61 (1), 2.
- ³⁷ Hubbard and Hubbard. *Your Cities Today and Tomorrow*, p. 93.
- ³⁸ Aronson. *Bell’s Electric Toy*, p. 21–22
- ³⁹ Pool. *The Social Impact of the Telephone*, pp. 156 5,.

- ⁴⁰ Briggs. *The Pleasure Telephone*, p. 40. Cf. Edward Bellamy. *Looking Backward*. Boston: Ticknor, 1887.
- ⁴¹ *Literary Digest*, vol. 44, March 16, 1912, pp. 528–29; Arthur F. Colton. *The Telephone Newspaper*. *Telephony*, March 30, 1912, 62 (13), 391f; *The Budapest News Telephone Telephone*. *Telephony*, March 13, 1909, 7 (11), 312; *News Service By Telephone*. *Telephony*, Nov. 1906, 12 (5), 297. Various experiments were conducted in giving speeches by phone to an assembled audience. Cf. *The Telephone As an Entertainer*. *Telephony*, May 18, 1912, 62 (20), 610; *Campaign Speeches By Telephone*. *Telephony*, Oct. 3, 1908, 16 (8), 338 f. Election returns by phone were often mentioned in *Telephony*: Oct. 24, 1908 16 (11), 423; *Campaigning by Wire* Nov. 26, 1910, 59 (22), 626; Dec. 16, 1911, 61 (25), 752; Nov. 9, 1912, p. 63 (19), 770; Nov. 16, 1912, 63 (20), 763.
- ⁴² *London Times*, May 17, 1880, p.3.
- ⁴³ *Use of Telephone By Reporters*, *Telephony*, July 1905, 10 (1), 62.
- ⁴⁴ Cf. Casson, *The Social Values of the Telephone*.
- ⁴⁵ Cf. sections 1.4.5.2 and 8.1.4.
- ⁴⁶ *Telephony*, Dec. 15, 1923, p. 18.
- ⁴⁷ Pound. *The Telephone Idea*, p. 50. Cf. Arthur Page. *Social Aspects of Communication Development*, 6, 18.
- ⁴⁸ Dilts. *The Telephone in a Changing World*, p. 47.
- ⁴⁹ Cherry. *The Telephone System*, pp. 124–125; Boettinger. *Our Sixth-and-a Half Sense*. p. 203; Perry. *The British Experience 1876–1912*, pp. 77–78.
- ⁵⁰ A.H. Hastie. *The Telephone Tangle and the Way to Untie It*. *The Fortnightly Review*, 1890 70, p. 894.
- ⁵¹ Dilts. *The Telephone in a Changing World*, p. 38.
- ⁵² Pound. *the Telephone Idea*, p. 52.
- ⁵³ Robert H. Ferrell. *American Diplomacy in the Great Depression*. Bloomington, Ind.: Archon Books, 1969, pp. 106–15.
- ⁵⁴ Herbert Hoover. *The Memoirs of Herbert Hoover*. New York: The Macmillan Company, 1952. p. 72. *The New York Times*, June 28, 1931, p. 1; June 29, 1931, p. 10.
- ⁵⁵ Dilts. *The Telephone in a Changing World*, p. 19; cf. *How Uncle Sam Uses the Telephone*. *Telephony*, Jan. 22, 1910, 9 (4), 91.
- ⁵⁶ Dilts. *The Telephone in a Changing World*, p. 20.
- ⁵⁷ Dilts. *The Telephone in a Changing World*, pp. 188–89. A more modest forecast by William F. Ogburn in *Technology and International Relations*. Chicago: University of Chicago press, 1949, was that the contact inventions, among which he included the telephone, would reduce international heterogeneity (p. 10).
- ⁵⁸ Casson. *The Social Value of the Telephone*, pp. 904–905. Cf. *The Indispensible Telephone*. *Telephony*, Nov. 1906, 12 (5), 296; *Action at a Distance*, 17, p.39.
- ⁵⁹ Cf. Westrum, *The Historical Impact of Communication Technology on Organization*, p. 7; Albert Speer. *Inside the Third Reich*. New York: Macmillan, 1970, p. 304, on Hitler's control of the field.

5

The Telephone in Emergency Services

5.1 The telephone will promote a sense of security. (Type C)

Wurtzel and Turner analyze a situation long after the period we are studying, namely a fire in a telephone exchange that occurred in 1975.¹ They interviewed residents of an area of lower Manhattan where telephone service was knocked out for three weeks. They found a decided increase in anxiety, particularly about not being able to *receive* phone calls. The respondents knew that they themselves were all right, so they did not worry about not being able to phone out, but since they normally relied on the telephone to inform them if anything happened to loved ones who were not at hand, they worried about not being able to receive incoming calls.

While we have no such rigorous data from the period that we are studying, casual observations about the phone as a source of reassurance were made innumerable times. Most often the comments were made regarding farmers (cf Section 2.2.1.2). Observations were also made regarding housewives left in the suburbs when their husbands commuted to work.²

5.2 The telephone will be used for rapid mobilization of a variety of emergency services. (Type A)

A number of examples of types of emergencies were commonly cited.

5.2.1 Floods. (Type A)

Casson³ cites an operator who drowned staying by her switchboard to warn her customers.

5.2.2 Forest Fires. (Type A)

Many references could be cited.⁴

5.2.3 Coast guard and frontier services. (Type A)⁵

Again, citations referring to the use of the telephone for such purposes are common.

5.2.4 Weather warnings. (Type A)⁶

Dilts notes that the weather bureau warns the phone company of impending storms, so more operators can be put on duty to handle the extra emergency traffic.⁷ Numerous sources cite situations in which farmers saved their crops thanks to weather alerts. Dilts tells of California citrus growers having plugs for portable phones out in their fields so as to receive notice of impending frosts.⁸

5.2.5 Fire prevention. (Type A)

In the past most fire fighting systems relied primarily on telegraphic signalling and only to a limited degree on the telephone. The location of the fire was crudely encoded in the alarm signal. Because firemen worked as a team and consistently returned to the fire station after a call, there was no need for a two-way point-to-point communications network (except for a fire squad wanting more assistance). The telephone operator did not serve to organize the fire company since they already had strong internal organization.

By the time the telephone fire alarm system made its debut in 1878 in Burlington, Iowa, its telegraphic counterpart was 27 years old and in use in 75 major cities and towns. District telegraphs, which sent coded messages summoning messengers, policemen, and doctors as well as acting as fire alarms, had been in use in private homes for at least eight years. Various ideas for telephonic fire alarms were promoted, for example in Paris in 1893,⁹ and the U.S. in 1905¹⁰ and 1920¹¹ but failed to take off. In particular, use of the regular switched network suffered from the fact that 24-hour service was not provided as a regular practice until about 1914. The need for it had been recognized as early as 1884.¹² The telephone, when it appeared in fire alarm systems, was mostly an appendage for use by firemen to call headquarters. On the British Isles in the 1930s, fire alarm boxes were telegraphic with telephone jacks. Double-headed boxes were quite popular, with police or ambulance alarms on adjacent boxes to the fire alarm.

If one asks why, in the United States, telephone companies did not design systems better adapted to the needs of municipal fire fighters, and proselytize for that business, the answer seems to be that municipal customers offered far less profit than commercial ones. To win the former took politicking and graft; also, payment for service was less prompt than on the private market.

5.2.6 Crime and law enforcement.

At least from the turn of the century, the telephone was seen as useful to both the police and criminals. Usually it was not the same authors who saw both points.¹³ Critics of the telephone stressed its use in crime; enthusiasts stressed its use in crime prevention.

5.2.6.1 The telephone will improve law enforcement. (Type B)

In their most enthusiastic statements commentators sometimes forecast that the telephone would so tip the balance between “hunters” and “hunted” that the problem of ordinary crime would virtually be solved.¹⁴ A villainous anarchist, in a 1902 short story, connects a bomb to a phone to be detonated by his call. But in the happy ending, the bomb is detached seconds before he rings; the police trace his call and catch him.¹⁵ Not until late in the nineteenth century did the police make professional use of the telephone. V. A. Leonard offered as an explanation the lax organization of police departments during the 19th century and the self-image of a police officer as a free agent rather than a member of a team. He writes in a book entitled *Police Communication Systems*:

The need for a complex communication system which would serve as the central nervous system of a highly integrated organism for the suppression and prevention of crime was not perceived until after police organizations began to move from under the rigid control of political officials. With the introduction of some civil service reform and the consequent development of the idea that police work was a specialized profession, police communication began to receive the attention it deserved.¹⁶

The United States did not take the lead in the area of police call boxes.¹⁷ By the early 20th century, telephones were appearing in police signalling systems abroad. Rio de Janeiro had a complicated system by 1908. Citizens were authorized to purchase keys that would allow them to call for assistance from any of the call boxes. An officer at the police station received the telegraphic signal (much like a fire alarm signal) and transmitted it to the nearest police post. At the police post, a gong sounded the call box number and the number appeared on a sign. Six policemen and a car were then dispatched to the scene of the alarm. By using another key, policemen had access to an inner box with a dial telegraph and telephone at their disposal. The dial telegraph permitted them to set a pointer to a legend on the dial indicating an accident, a fire, and so forth. The telephone was used to communicate directly with any point in the alarm system, and often by headquarters to give instructions to a patrolman—again signalling him with a light or bell. In 1913, a *Scientific American Supplement* carried an article on a Berlin system in which contact boxes were installed on the streets 300-400 meters apart.¹⁸ Every policeman carried with him a telephone jack the size of a watch. Access to the contact boxes required a key. The police department had its own switchboard, which was tied into the municipal system, so the policeman could call not only the district station but also anywhere in the general telephone system.

In the United States, as the telephone gained popularity among police departments, a rival mode of communication emerged—the radio. In 1915, one police department was experimenting with a radio telephone and telegraph set that attached to a motorcycle like a sidecar, and had a transmitting power of one kilowatt.

One major role of the telephone in police work is for citizen reporting of crimes.¹⁹ A 1931 New York City Police Department campaign urged citizens to use the telephone to give information to the police department. Information on criminals could then be broadcast over police radio. Nonetheless, by 1938, Leonard wrote:

Because of the dual advantage of telephone communication . . . its adaptability to police uses . . . and its instant convenience for calls from citizens . . . telephone service in the modern police department has come to be the very backbone of its communication system. It carries most of the communication load, as it should.

In the setting up of a telephone system, the primary problem is one of economic selection—how to do the satisfactory thing at the lowest cost.²⁰

Hindsight induces a jaundiced view of those forecasts which saw the telephone as defeating crime. Such prognoses, we should note, were not made by developers of the telephone system, nor by law enforcement experts, but rather by journalists and reformers. Yet let us not be too complacent about our hindsight. Why were the forecasts that the telephone would significantly reduce crime wrong? Even with all the advantages of hindsight, it is hard to say. *A priori*, it seems sensible that an instrument permitting well organized, dispersed police agents to make contact and warn each other about suspects much faster than the suspects could move should make things harder for lawbreakers. Yet crime increased in the same years that the telephone became available to the authorities; this tells something about the limits of social forecasting based on assessment of one isolated technology. To understand the anomaly of growing crime in the same period as improved technologies of law enforcement, one must understand such matters as the public's attitude toward minor crime, the judges' behavior in sentencing, the organizational incentives in the legal process, the social structure of migrant and ethnic groups in the society, and the nature and reliability of crime statistics.

5.2.6.2 Telephone crime will become α problem. (Type B)

The earliest full scale statement that we have found is an article by Josiah Flynt in 1907 on "The Telegraph and Telephone Companies as Allies of the Criminal Pool Rooms." Flynt charges:

Because they are among the country's great "business interests," because the stock in them is owned by eminent respectables in business,

and because they can hide behind the impersonality of their corporate existence, they have not been compelled to bear their just share of the terrific burden of guilt. But they have been drawing from five to ten million dollars a year as their "rakeoff" from the pool rooms. . . . Every one of the estimated four thousand pool-rooms throughout the United States is equipped with telephones used for gambling purposes and for nothing else.

Flynt charges that 2% of the New York Telephone company revenues, a million dollars a year, were derived from gambling in pool rooms. He rejects the argument that the phone company should not attend to what subscribers say on their lines; the company, he says, knows full well who the criminal users are, but simply does not wish to forgo the profits of sin.²¹

Prohibition coincided with the telephone system's years of evolution to a national network and total penetration. The bootleggers and the rackets made full use of whatever was available to run their operations;²² it is hard, however, to take seriously the argument of causality—that somehow there would have been less crime without the telephone.

Other writers deal with telephone confidence men, use of the telephone by burglars to ascertain whether anyone is at home,²³ and the special telephone crimes of cheating the phone company, wire tapping, and call girls.²⁴

The courts in numerous cases took note of the use of the phone in illegal activities and held the phone company justified or indeed obligated to refuse phone service for those. In the case of *Godwin v. Carolina Telephone & Telegraph Co.* 48 SE 636 (Oct. 18, 1904), the court wrote that "while it is true there can be no discrimination where the business is lawful, no one can be compelled, or is justified, to aid in unlawful undertakings." The court held that the phone company would not be required to provide a phone for a home used as a "bawdy house." The phone company was granted the ability to determine the nature of the use to which the phones would be put. In *People ex rel. Restmeyer v. New York Telephone Co.* 159 NYS 269 (June 2, 1916), the court held that the police could, once determining that a location was violating the law, ask the phone company to remove the instrument.

5.2.7 Medicine.

Physicians were among the earliest users of the telephone in the United States. For example, in 1877 a Hartford druggist organized a physicians' phone exchange.²⁵ In those early days when there were few subscribers, groups of people who had a common interest in communicating with each other would tend to subscribe at the same time. Thus in Hartford the initial group were physicians. (A glance at the earliest London telephone book reveals few physicians but many solicitors.) An event that gave the telephone much favorable publicity was a railway accident near Hartford. The exchange was able to mobilize a large team of doctors and horses in great haste.²⁶

There were numerous stories of a child's life being saved by a quick call to the doctor.²⁷

Less common but more significant were statements about how the telephone was changing the practice of medicine.

5.2.7.1 The telephone will aid in physician and ambulance routing. (Type A)

"Imagine the shock to a city's nerves" wrote Arthur Pound in the telephone semi-centennial volume, "if it should awake one morning to find that no doctor could be sought by telephone, if no ambulance could be summoned by telephone to remove the victims of a street accident or train wreck, if no hospital beds could be reserved and no nurses engaged by telephone."²⁸

Doctors travelled continually to obscure places, and, unlike firemen or policemen, lacked a team or headquarters; they typically relied on their families and telephone operators to contact them. For the patient there was previously no reliable way of reaching a physician other than coming to his office at visiting hours. So operators in the 19th century often monitored doctors' movements and kept in touch with them.²⁹

There was apparently much ambivalence among physicians about the impact of the telephone on their practice. Some articles said that the telephone saved them needless journeys³⁰ or that it helped in bad weather or at night,³¹ but other articles said that patients with telephones find it easier to reach the doctor to request a house call, especially at night when they are apt to feel worst.³²

5.2.7.2 Doctors will increasingly make diagnoses and give advice over the telephone. (Type A)

It took a long time for telemedicine to be accepted as good practice. Many doctors felt it unethical to reach a conclusion without seeing the patient. Also, telemedicine raised serious economic questions for the doctor; it is only in recent years that doctors have started billing for telephone advice, and they often do not do it even today. Yet the convenience of the phone, and the inefficiency of either the physician or the patient taking a trip when all he needs is aspirin and bed, have in the end made telemedicine the rule rather than the exception.

Even if full acceptance of telemedicine came slowly, its occasional practice came early, both in emergencies and in minor cases coupled with logistical obstacles to contact. Anecdotes about such matters are common.³³

Medicine, unlike fire fighting or crime fighting, is a service where advice may be substituted for the actual presence of a professional. The telephone allowed people to feel that the doctor, or at least his advice, was only as far away as the phone. As people came to rely on the phone to find and query a doctor, it became increasingly important for every doctor to have a telephone in order to maintain his practice.

5.2.7.3 Paramedical telephone counselling services will develop. (Type A)

We find little anticipation of this in the period of our study, although a 1919 story notes that use of the lines had been materially increased by “absent treatment” of patients by Christian Science leaders in Los Angeles.³⁴ Lester has described the many “hot line” services that now exist, but these are largely a post World War II development.³⁵

5.2.7.4 The telephone breaks up doctors' neighborhoods. (Type B)

This is a special case of the break-up of single-trade neighborhoods which we have discussed previously (Section 2.1.1). As the *Literary Digest* put it, doctors' “place of congregation now is the telephone book instead of ‘doctor’s row.’”³⁶

5.2.7.5 The break-up of doctors' neighborhoods and the ability to reach established doctors by telephone makes it harder for young doctors to start their practice. (Type B)

The *Literary Digest* article just cited made this point in 1912. Physicians “group themselves in one section or one street, the object being on the part of the new man to possibly receive the call which would have gone to a neighboring physician had that neighbor not been out at the time.” With the passing of that symbiotic relationship, young physicians were more on their own.

5.2.7.6 The telephone spreads disease. (Type C)

One common fear in the early day of the telephone was that the mouthpiece, particularly on public phones would harbor germs and spread diseases, especially tuberculosis.³⁷

Research was done to assess this danger. The usual conclusion was that the danger was small,³⁸ though germs might be found in the mouthpieces. Advertisements and articles urged the use of disinfectants on mouthpieces.³⁹

We have not been able to establish why this fear has so largely disappeared.⁴⁰ Perhaps the reason is habituation, or perhaps the realistic realization that the danger is not large.

FOOTNOTES

¹ Alan H. Wurtzel and Colin Turner. Latent Functions of the Telephone: what Missing the Extension Means. In Pool. *The Social Impact of the Telephone*.

² Robinson. *Improvement of Towns and Cities*, quoted in section 9.2.

³ Casson. *The Social Value of the Telephone*, p 904.

⁴ Cf. Bergengren. *The Far-Flung Telephone*, p. 67; Casson, *The Social Value of the Telephone*, p. 904.

⁵ Cf. Dilts. *The Telephone in a Changing World*, p. 81.

⁶ Cf. section 2.2.1.3.

⁷ Dilts. *The Telephone in a Changing World*, pp. 78–80.

⁸ Cf. The Telephone Exchange, *The Spectator*, September 20, 1879, 52, 1188; Cason. *The Social Value of the Telephone*, p. 906.

⁹ New Policy Signal, *Scientific American*, Sept. 28, 1895, 73, 204.

¹⁰ Vinton A. Sears (Ed). *Telephone Development: Status of the Industry, Scope and Effect of Competition* (2nd ed). Boston: Banta Press, 1905.

¹¹ A Fire Alarm System Which Telephones Its Message, *Scientific American*, may 1, 1920, 122, 494.

¹² AT&T. *Events in Telephone History*, Sept. 1974, PE/109, p. 11.

¹³ But see Crime and the Telephone. *Telephony*, March 27, 1909, 17 (13), 377, which notes both.

¹⁴ Cf. Dilts. *The Telephone in a Changing World*, pp. 82, 177.

¹⁵ Lawrence Vanzile. *Revenge By Telephone*. *Telephony*, Sept. 1902, 4 (3), 128–9. Cf. Edgar Wallace. *Four Just Men*. London: Tallis Press, 1909; non-fiction treatments in Bergengren. p. 69; *The Telephone As a Detective*. *Telephony*, Dec. 1907, 14 (6), 351; *Heroism* 13 (1), 36.

¹⁶ V.A. Leonard. *Police Communication Systems*. Berkley: University of California Press, 1938, p. 6.

¹⁷ Although police departments had subscribed to telephones ever since the Washington department took 15 in 1878, they did not deploy them to the beats. On July 20, 1886 the *New York Tribune* ran an editorial criticizing the New York police for not doing what the Brooklyn police had done, connecting the stations with the central office by telephone. The *Tribune* remarked that “doubtless the time may come when every patrolman’s beat will be furnished with one of these instruments.” Cited in Leonard, *Police Communication Systems*, p. 10.

The Chicago department had been the first to move in that direction. Between 1880 and 1893 over 1000 street boxes were installed. The popularity of such systems received a boost in 1889 when a murderer was caught at the railroad station a few hours after all police in the city had been notified of his description by the phone network.

An article on call boxes, *New Police Signal*, appeared in *Scientific American*, 1895, 73, 204.

¹⁸ A. Gradenwitz, “German Police Telephone,” *Scientific American Supplement*, January 25, 1913, 75, p. 61.

¹⁹ In the heyday of the independent phone companies, one of their selling points was to allow free emergency calls from coin boxes, because many of them used deposit-after-connection devices. They attacked the inhumanity of the Bell System’s nickel-first device which could prevent an emergency call if one did not have a coin available. Cf. *Emergency Calls*, *Telephony*, July 1906, 12 (1), 36; *The Unpopular “Nickel First.”* *Telephony*, Sept. 16, 1911, 61 (12), 324.

²⁰ Leonard. *Police Communication Systems*, p. 52.

²¹ Josiah Flynt. *The Telegraph and Telephone Companies as Allies of the Criminal Pool Room*. *Cosmopolitan Magazine*, May 1907, 43, 50–57.

²² In 1936, the Chief Counsel for the Walker investigation opened his hearings with testimony on the use of the telephone by bookies. Arthur Page, *The Bell telephone System* (N.Y.: Harper Bros., 1941).

²³ Cf. The Burgler and the Telephone. *Telephony*, Aug. 1907, 14 (2), 921.

McLuhan. *Understanding Media*, p. 233 attributes the elimination of red light districts to the call girl and the telephone.

²⁵ Aronson. Bell's Electric Toy, p. 24.

²⁶ Dilts. *The Telephone in a Changing World*, p. 9.

²⁷ E.g., Casson, The Social Value of the Telephone, p. 906; P.C. Henry. A Cooperative Telephone. *Country Life in America*, May 1913, 24, 68; E. E. Free. Few Telephones May Mean High Death Rate. *Literary Digest*, May 24, 1930, 105, 34.

²⁸ Pound. *The Telephone Idea* p. 39. There were numerous discussions of the usefulness of the telephone when accidents occurred. For example, *World's Work*, December 1913, 27, 237-38, describes a "Throat Transmitter Telephone" for use in mines to call for help in accidents.

²⁹ Aronson. Bell's Electric Toy.

³⁰ The Telephone in the Medical World. *Telephony*, 1, Jan. 4 1913, 64 (1), 42.

³¹ Telephone and the Doctor. *Literary Digest*, May 18, 1912, 99, 1037.

³² Doctors and Rural Telephone. *Telephony*, June 1905, 9 (6), 492.

³³ Cf. Doctors and Rural Telephone, p. 492; Talking by Wire, *Bristol (England) Times*, November 7, 1879, p. 1.

³⁴ The Silent Use of the Telephone, *Telephony*, Oct. 30, 1909, 18 (18), 440.

³⁵ David Lester. The Use of The Telephone in Counseling and Crisis Intervention. In Pool. *The Social Impact of the Telephone*.

³⁶ The Telephone and the Doctor, *Literary Digest*, May 18, 1912, 44, 1037.

³⁷ Telephonic Germs and the Doctors. *Telephony*, Sept. 1905, 10 (3), 220-29; The Transmitter Mouthpiece and Tuberculosis. *Telephony*, April 27, 1912, 62 (17), 51; A Vest-Pocket Transmitter for the Telephone. *Scientific American*, Feb. 3, 1912, 106, 112; H.R. Van Devanter. A Telephone Transmitter without a Mouthpiece. *Scientific American*, May 24, 1913, 108, 468. Other fears concerned damage to hearing: Is the Telephone Making Us Left-Eared. *Telephony*, July 1904, 8 (1), 74; Telephone Does Not Injure Hearing. *Telephony*, 6, June 1907, 13 (6), 399.

³⁸ Cf. Consumption and the Telephone. *Current Literature*, Nov. 1908, 45, 571; Telephonic Germs and the Doctors, pp.220-21; and The Transmitter Mouthpiece and Tuberculosis, p. 51.

³⁹ Ventilation of Telephone Booths. *Telephony*, Feb. 1908, 15 (2), 131; Red Cross Telephone Disinfectant. *Telephony*, June 10, 1911, 60 (25), 705-706.

⁴⁰ But not completely. In 1976 the German magazine *Quick* ran an investigative report on dirty coin phones. On examining 250, they said they found germs that could cause bone and kidney inflammations and fatal fungi. (*Asahi Evening News*, Tokyo, December 11, 1976.)

6

The Telephone, Resource Use and the Environment

6.1 Overhead wires are an eyesore. (Type C)

6.2 Overhead wires are a danger. (Type C)

As the telephone network grew, the wires in the streets became intolerable. Pictures from the time show an enormous mass of wires strung from pole to pole.¹ They not only spoiled the view, they also dripped in a thaw, blocked firemen, and occasionally fell on houses and passers-by. So great was the threat to the environment that in 1880 and 1890 New York City sent axmen to chop down telephone poles.²

The phone company recognized the writing on the wall and a great deal of research went into mastering the problem of underground cables, which at first suffered from excessive attenuation. In the end they became the standard solution in built-up areas.

6.3 The increase in the size of the telephone system threatens the depletion of trees. (Type C)

One of the problems frequently discussed in early issues of the trade journal, *Telephony*, was the sources and supply of trees suitable for telephone poles, and their treatment for preservation.³ As time passed and the system grew, it became apparent that the demand for such trees would exhaust the supply of them. That was one incentive for laying underground cables. Also experiments were run with substitute materials for telephone poles.⁴ Incidentally, it was noted in 1936 that the telephone directories were using 25,000 tons of paper a year, but papermaking used different types of trees.⁵

6.4 The increase in the size of the telephone system threatens the depletion of copper supplies. (Type C)

Another problem addressed by research was reducing the thickness of copper wire needed to carry a telephone message. The Pupin coil, for example, contributed greatly to reducing attenuation and thus permitted the diameter of wires to be cut from one eighth inch in 1900 to one sixteenth in 1910. (Cf, Section 1.3).

The copper supply remains, even to this day, a potential problem for telephone system development. Shortages reveal themselves first in the market in the form of price increases. A few years ago, at about the same time as the oil crisis, there was a rapid increase in the price of copper. It was one of the factors that led to great interest in optical fibers. Silver wires are even better than copper, but are obviously too expensive; aluminum wires are inferior. Optical fibres are the likely substitute of choice.

Subsequent to the 1974 run-up, the price of copper collapsed again, removing the pressure, but only temporarily. It is possible that a copper problem may be avoided in the long run only by the widespread use of optical fibers.

FOOTNOTES

¹ Cf. AT&T. *The Telephone in America*. AT&T, 1936, p.33; Edward Mott Wooley. a \$100,000 Imagination. *McClure's Magazine*, May, 1914, 43, 128.

² Dilts. *The Telephone in a Changing World*, p. 26.

³ Cf. To Prolong Life of Telephone Poles. *Telephony*, July 1905, 10 (1), 51.

⁴ Hendrick, "Telephones for the Millions," p. 55.

⁵ AT&T. *The Telephone in America*, p.36.

7

The Telephone and Complementary Services

7.1 The telephone and the transport industry.

7.1.1 The telephone will help in coordinating trains, traffic, and deliveries. (Type A)¹

Casson reports that:

In the operation of trains the railroads have waited thirty years before they dared to trust the telephone, just as they waited fifteen years before they dared to trust the telegraph. In 1883 a few railways used the telephone in a small way, but in 1907, when a law was passed that made telegraphers highly expensive, there was a general swing for the telephone.²

The telephone, he claimed, cut the message time in half, and more important, did not require a trained Morse code operator at every location.

We noted previously (section 3.4.3) references to the use of the telephone in the rapid distribution of perishables. In general, the greatest business use of the phone has been in finance, commerce, and where complex logistical coordination is required.

7.1.2 The availability of the telephone reduces the need to travel. (Type A)

Discussion of the communication/transportation trade-off is not new. It was noted early that the telephone could save its user many trips.³ As we have already noted (3.4.4), the pattern of activity of travelling salesmen changed,⁴ and some railroads claimed to be able to feel the resulting decline in their traffic.

That the impact of the telephone in reducing travel was not dramatic is testified to by Casson who says, "slowly and with much effort the public was taught to substitute the telephone for travel."⁵

7.1.3 The telephone increases relationships with people at a distance, thus leading to an increase in travel. (Type B)

In the early literature we have not found examples of this proposition, the opposite of 7.1.2, that is often put forward today.

7.2 The telephone and the post and telegraph industries.

7.2.1 Substitutability.

7.2.1.1 Since phone, post, and telegraph can serve many of the same purposes, whichever is well run will thrive at the expense of the others. (Type C)

Burton Hendrick, among others, noted the difference in development of the different modes in the U.S. and Europe. "The European more often writes or telegraphs; the American more frequently telephones."⁶ At that time, he reports, it took 90 seconds to get a suburban connection in New York City, and 30 minutes in London. It is not surprising that at that time 70% of the world's telephones were in the United States. Hendrick also reports rural free delivery at that time served 58,000 communities; the phone served 70,000. By 1911 Western Union's gross was but \$38 million compared to AT&T's \$179 million.⁷ Conversely, in many countries of Europe mail, telegraph, and now telex service are better than in the United States, and, as we noted in the Introduction, are more used.

7.2.1.2 The telephone will cause declines in the post and telegraph systems. (Type B)⁸

While the previous proposition merely noted a competition that could go either way, those who were more optimistic about the prospects of telephony noted that the growth of telephone usage would be partly at the expense of post and telegraph.

That the telephone represented a threat to the telegraph was recognized from the day of the phone's invention. There is a widely believed story that Western Union was so blind to the importance of the telephone that it refused the Bell patents for \$100,000, with Orton the President of Western Union remarking, "What use would Western Union have for an electrical toy." The story is largely apocryphal but like most myths continues to be believed because it sounds so "true to life." The correct version can be found in Bruce's standard biography of Bell.⁹ There is no substantial evidence that Orton ever said exactly that.¹⁰ It is true that Western Union foolishly rejected an offer of the Bell patents for \$100,000—surely one of the worst business decisions of all time. The reason, however, was not an

underestimation of the telephone. The reason was that Orton believed that his company could develop telephone service under the Gray and Edison patents and did not need Bell's. An irrational element did enter into that decision: Hubbard, Bell's father-in-law, had been a populist crusader against Western Union's service, promoting a bill in Congress to create a rival postal telegraph system. Orton found the idea of enriching his critic, Hubbard, very distasteful. But he did not doubt the importance of the telephone.

The telephone had a number of advantages over the telegraph.

7.2.1.2.1 Telephoning is faster than telegraphing. (Type A)

Words are spoken at more than twice the speed that they can be tapped out, even by an expert telegrapher.¹¹ Add to that the time for originally writing out the text, carrying it to the telegraph office, and delivering it to the receiver. We have already noted the time saved by the *London Times* when it installed a phone at the House of Commons.

7.2.1.2.2 The telephone goes end-to-end; it requires no messenger to and from the offices. (Type A)

We have previously noted *Punch's* comments on this and on 19th century efforts to create end-to-end printing telegraphs (cf. Sections 1.1.2; 1.4.1). The nearest to this goal that was widely achieved was installing electric call bells from frequent users to the local telegraph office. When the business had a telegram to send someone would buzz the telegraph office a few blocks away and a telegraph boy would come to pick up the message.

Even today, in places where telephone service is inadequate, the phone is used more for the delivery of commands and messages than for discussion. This author has been engaged in a study of telephone use in Egyptian villages. One of the surprises has been that incoming calls are often not to the ultimate target person, but are instructions and messages dictated over the phone for delivery to the addressee. The point is that there are so few phones in an Egyptian village that the odds are very small of being able to call directly to where the target person is. The caller has to use the phone like a telegraph, as a way of getting his message to an office from where it can be delivered. Only with the growth of a more pervasive phone system did it become a more democratic instrument for two-way interaction.

7.2.1.2.3 The telephone allows two-way interaction in real time. (Type A)

This point, though understood, was discussed surprisingly little in the early days of the telephone. There was instead a tendency at first to anticipate that the

phone would be an instrument for hierarchic interactions; giving instructions rather than negotiating and discussing. Cherry notes this and quotes an 1877–78 advertisement describing uses of the phone including communications between “principles and employees,” “central and branch banks,” “superintendent and his leading men,” “manager’s office and the employees.”¹²

To appreciate why this hierarchic perception was common at first, we must recall that the first subscribers to telephones tended to be business owners who needed to keep control of two or more separated premises. Also, poor fidelity made telephoned words not always easy to understand. It was only when the phone became both more pervasive and also was improved in fidelity that many equals found they could use it to engage in discussion.

7.2.1.2.4 The telephone’s labor costs are lower than the telegraph’s. (Type A)

A telephone call required only the brief attention of a relatively low-skilled switchboard operator at the beginning and end of the conversation. A telegraph required two highly skilled Morse code operators throughout the transmission.

Telegraphers in that day’s labor force were what computer programmers are today. They had a scarce skill which earned them high pay. They had to be bright and quick, but they did not have to come up through any conventional educational or experience channel. It was therefore an ideal job for a highly intelligent non-conformist. But unlike contemporary programmers, they had to locate themselves in isolated remote locations. There they tended to be the local bohemians.¹³ In any case they were expensive and sometimes critically missing.¹⁴

7.2.2 The telephone eliminates jobs for telegraphers. (Type B)

This is a simple corollary of the last point. When railroads, for example, replaced telegraphs with telephones, either telegraphers were discharged or new ones not hired. At local rural stations the station master could handle the phone calls himself. He no longer needed a Morse code operator with him.¹⁵

In a report on the Philadelphia Centennial Exposition of 1876, at which Bell first exhibited his phone, the *New York Tribune* asked what might be the use of this “curious device.” It replied: “There may be occasions of state when it is necessary for officials who are far apart to talk with each other without the interference of an operator”—by which it meant telegrapher.¹⁶

7.2.3 The telephone and telegraph will form one integrated system with shared lines. (Type A)

This was perhaps an erroneous expectation; it has not happened yet. But with the coming of computer communications there is reason for thinking it may yet happen. The independent telegraph system is declining; it now rents many lines

from AT&T and it telephones its telegrams. Computer networks operate over phone lines. Leased lines are multiplexed with voice and teletype. Yet the early attempts to use phone lines for telegraphy, to use telegraph lines for telephones, and to merge the companies were all frustrated, partly by antitrust action and partly by differing technical requirements that made multiple use less attractive economically than it may have seemed at first glance.

In 1892 the Bell System had developed and offered in private line service a simplex method of carrying both voice and telegraph on the same line.¹⁷

The technical possibility of multiplexing voice and telegraphic code on the same line was shown by Major George Squires of the Signal Corps about 1910. Anticipating acquisition of Western Union, the Bell System had started research on that topic in the previous year.

In 1910 AT&T bought control of Western Union for \$30,000,000. Vail had hopes of really creating one universal system.¹⁸

However, in 1913 federal antitrust action forced divestiture as part of the Kingsbury commitment. Some relations remained between the two systems. Telegrams were accepted by phone.¹⁹ After 1914 AT&T continued in the teletype field, acquiring and merging a couple of companies into the Teletype Corporation in 1929 (which too it was later forced to divest) and offering two-way teletype service as of 1931.²⁰

FOOTNOTES

¹ Cf. Telephone Used to Signal Trains. *Telephony*, July 1904, 8 (1), 67; The Telephone in Railway Service. *Telephony*, 6, December 1906, 12 (6), 358–59; The Telephone and Railroads. *Telephony*, June 1907, 13 (6), 369.

² Casson. The Social Value of the Telephone, p. 902.

³ *The Spectator* in 1879 (September 20, 52, 1187–88) predicted that the home phone would be used in place of personal meetings. Cf. Wells. *Anticipations*, pp. 65f.; The Telephone in Modern Business. *Telephony*, Nov. 1901, 2 (5), 190–91; James K. Pollock, Jr. *Party Campaign Funds*. New York: Knopf, 1926, pp. 154–5 (in regard to campaigning); Value of Rural Telephones, *Telephony*, Aug. 1906, 12 (2), 117, and The Farm Telephone, *Telephony*, Jan. 1908, 15 (1), 23 (on saving farmers trips to town.); The *Scientific American* in 1914, Action at a Distance, predicted less transport congestion.

⁴ The Telephone in Modern Business. *Telephony*, Dec. 1906 12 (6), 353.

⁵ Casson. The Telephone As It Is Today, p. 12777.

⁶ Hendricks. Telephone for the Millions.

⁷ Cf. Elbert Hubbard. *Our Telephone Service*. East Aurora, N.Y.: Roycrofters 1913.

⁸ Cf. The Telephone and Telegraph. *Telephony*, Sept. 1902, 4 (3), 121; The Telephone Letter. *Telephony*, Nov. 1905, 10 (5), 362.

⁹ Bruce. Bell.

¹⁰ Gray once used the phrase “electrical toy”.

¹¹ A telegrapher according to Aronson (Bell’s Electric Toy, p. 17) averaged about 25 words per minute.

¹² Cherry. The Telephone System, p. 121.

¹³ For a discussion of the character of the telegrapher's way of life, and their rise and fall see W. Fred Cottrell. *The Railroader*. Stanford, California: Stanford University Press 1904.

¹⁴ Bismark introduced the phone into Germany to provide communication to rural post offices too small to afford a telegrapher. (Dilts. *The Telephone in a Changing World*, pp. 11f.)

¹⁵ But cf. G. K. Heyer. The Telephone and the Railroad. *Scientific American*, Supplement, Dec. 17, 1910, 70, 388–89, minimizing that expectation.

¹⁶ Lally Weymouth. *America in 1876*. New York: Random House, 1976.

¹⁷ Cf. *Events in Telephone History*, p. 11; also Simultaneous Telegraphing and Telephoning. *Scientific American*, June 6, 1904, 90, 459.

¹⁸ See AT&T Annual Report for 1910 for a statement of that aspiration.

¹⁹ This practice in London was noted by *Telephony* in Sept. 1902. 4 (3), 119.

²⁰ In 1933, Wiley and Rice, *Communication Agencies and Social Life*, op. cit. (see p. 93 Fn. 58) noted that "modern technology is tending to obscure and even eliminate the customary distinctions between" telegraph and telephone as well as between wired and wireless service, as new hybrid services develop. (p. 146). In present-day commentary this process is referred to as "convergence of modes" and is generally identified as an important current trend.

8

System Development

3.1 The development of a telephone system stimulates research and development. (Type A)

No aspect of the American telephone system deserves more admiration than its scientific research. Bell labs is one of the most creative research organizations of all times. No doubt the superb quality of Bell labs was a result of human choices and not an inevitable result of the phone system; many other countries have telephone laboratories that are more derivative and less creative. Yet they all have labs. Some major push in the direction of research and development (R & D) would seem to have been a necessary result of trying to develop a telephone system.¹ Telephony would grow or not according to its relative efficiency as compared with competitive technologies such as mails, the telegraph, the phonograph, and radio, not to mention new devices in telephony. There were many problems of fidelity, reliability, transmission, and economy to be solved. The very size of a phone system created unprecedented problems of systems analysis. The company size as a unified organization made investment in R & D a profitable use of capital, for the benefits would be appropriated to the company and spread widely over users. Many studies have found that small companies in competitive industries can seldom justify spending the same percentage of income on R & D as large dominant ones.

In addition, in the telephone field the U.S. patent system worked as intended to stimulate R & D at that period. The early history of telephony is in large part a history of patent battles. R & D was largely oriented to “occupying the field” by patents.

Gardiner Greene Hubbard, Bell’s father-in-law, and Thomas Sanders, the two men who financed Bell’s original work, did so with the intention of acquiring patents that could be quickly and profitably sold. The name of the organization they formed in 1875 was the Bell Patent Association.

When the founders failed to sell their patent to Western Union, they continued the business by issuing franchises. They brought Vail on board and fought off Western Union’s rival Edison and Grey patents in the courts. That battle demonstrated the need for continuing research. One measure was the recruitment of Emile Berliner, who offered an answer to the advantages of

Edison's carbon transmitter. In 1879 the Bell interests won their case against Western Union; the latter conceded the validity of the Bell patent, withdrew from the telephone field, and licensed its patents to the Bell System for telephony.

Under Vail the company was reorganized with the acquisition in 1881 of a manufacturing company with its own research staff (Western Electric) and coordination of the system by the instrument of a long lines company (AT&T, formed in 1885) interconnecting the local companies. Research on long distance transmission was given priority even in periods of financial stringency and staff cuts.

Looking forward to the period of competition that would follow the expiration of Bell's fundamental patent in 1893, Vail felt that the company should "occupy the field" by the preemptive development of fundamental technology. However, Vail left the company, not to return until 1907. Management under Stockton, Hudson, and Hammond Hayes was less imaginative and technologically somewhat complacent. Hayes ran a significant research program on practical problems, but except for Campbell's work on long distance transmission, fundamental research, he felt, was better left to be borrowed from Harvard and M.I.T. Also, automatic switching was underestimated.

Between 1894 and 1907 the Bell system's competitors did indeed make several important innovations; particularly in mechanical switching. Pupin's coil anticipated what the company's laboratories were on the way to accomplishing, and his patent had to be bought. When financial control of the AT&T Company changed hands in 1907, the new management persuaded Vail to return to the company. Vail devoted his first efforts upon returning to AT&T to the reorganization of research. The reorganization was extensive and temporarily involved retrenchment.

The Boston laboratory was moved to New York, and its Chief Engineer, Hammond Hayes, was replaced by Vail's close associate, John J. Carty. The operating companies were instructed to discontinue all independent research work and to refer all new apparatus needs to the Engineering Department of the American Company. All inspection activities were assigned to Western Electric. Both funding and staff were cut back sharply (the number of research staff members declined until the summer of 1909). During this period of staff cuts and reorganization most engineering activity was directed towards improved standardization and quality control of apparatus. Carty also began to organize the new "research" sections; but the active development of fundamental research within the American company began only in 1911.

Following the period of retrenchment (1907-summer 1909), Carty organized a new research division. A series of comments by Carty between

1909 and 1911 reflect that the new division was to engage in basic research and that the direction of that research was to be into wireless technology:²

At the present time scientists in Germany, France, and Italy and a number of able researchers in America are at work upon the problem of wireless telephony. While this branch of the art seems at present to be rather remote in its prospects of success, a most powerful impetus would be given to it if a suitable telephone repeater were available. Whoever can supply and control the necessary telephone repeater will exert a dominating influence in the art of wireless telephony when it is developed. (1909)³

Both the staff size and research expenditure grew quickly between 1911 and World War I; “In 1910 there were 192 engineers employed in development work, and the expenditures were \$493,527. In 1916, there were 959 men, and expenditures amounted to \$1,539,621.”

But as we have noted in section 4.7.2.3, AT&T started too late to gain control of radio. In the end it had to surrender broadcasting in exchange for exclusive licenses for the wired telephony field.

This experience lay behind the formation of the Bell Telephone Laboratories in 1925. The heads of AT&T had seen how a new technology on the margins of telephony had threatened to create a new competitive system of communication that might have undercut the existing phone system. To try to avoid anything like that happening again, Bell labs was given a wide charter for fundamental research, not just in telephony, but in all the neighboring areas. Out of that research came the transistor, and much of the fundamental work in television, computers, information theory, and innumerable other scientific advances.

We will not try to list systematically all the major scientific and technological advances that came partially out of telephony.⁴ What follows is a rather arbitrary noting of some of the most important ones for the period before World War II. Those we list are technologies that in turn had significant social effects that should be noted in our assessment. The forecast, in each case, is that offspring of the telephone would become important to society in some particular uses.

8.1.1 The phonograph. (Type A)

The phonograph, invented by Edison in 1877, was not originally intended by him for its present use as a home music machine. He was working on a device to supplement the telephone by recording messages. We have already discussed the (Section 1.4.3) the various attempts to use the phonograph in connection with telephony.⁵ But, while it was never cost

effective in its intended use in telephony, it proved enormously successful as a music box.

8.1.2. The loudspeaker. (Type A)

This device was in use by 1916.⁶ Before radio broadcasting emerged as a promising prospect, the Bell System devoted considerable research effort to improving public address loudspeaking systems. These would have been important in telephony had use of the phone for entertainment not been pre-empted by radio; at the cost of doing the job by phone, listening might well have become a community activity rather than one carried on in each home.⁷

8.1.3 Sound movies. (Type A)

In 1922 a phonograph record was experimentally synchronized with silent film. The first Vitaphone movie was Warner Brothers' *Don Juan*. Vitaphone was a Western Electric product. A 1926 discussion of it in the *Bell Laboratories Record*⁸ takes a rather cautious view of its possibilities. Joseph Maxfield noted that the sound seemed imbalanced and detracted from realism during closeups. Nonetheless, by 1928 there were many sound films, the great majority of them made with Bell equipment; RCA was a distant runner-up.

ERPI, the Bell subsidiary established for the sound motion picture business, became a significant corporate factor in filmdom, so much so that when Hollywood film makers began to have financial problems in the 1930s the Bell System found it necessary to help finance them with rather substantial investments in movie making. Next to the Chase Bank, AT&T was, in the heart of the Depression, the principal funder of the movie industry.

8.1.4 Radio. (Type A)⁹

In section 4.7.2.3 we have traced the relationship of the Bell System with radio, and noted that the pioneering work was done by others such as Marconi and de Forest. However, after 1907 the Bell System made a major effort to catch up and develop the art.

The relationship of telephony to radio was not limited to the direct activities of the Bell System. A more fundamental question is how far the radio idea was influenced by the telephone experience. Our study of telephone development does not provide an answer to that question. At the time of the original work on wireless at the turn of the century, the word used for it was wireless telegraphy, suggesting that the telegraph was the model and the expectation was to send Morse code by pulses through the ether. But it did not take very long in an age when the telephone already existed for people to

speculate about the next step, i.e., wireless telephony. Recall that Bell had, as early as 1879, in a paper to the American Academy of Arts and Sciences in Boston, described a selenium radiophone working with light (cf. section 1.4.5.1). The first voice broadcast using radio transmission was made by Fessenden to ships at sea on Christmas Eve 1906. In the first third of the century there was considerable discussion of convergence of modes, not only between wired telephony and wired telegraphy (cf. section 7.2.3) but also between the wired and wireless systems.¹⁰

8.1.5 Broadcasting networks. (Type A)

We have noted in section 4.7.2.3 that networking of transmitters was part of the Bell System's conception of a broadcasting system, even at the time of its early experiments in that field (c. 1921). The long lines network has continued as Bell's part of the broadcasting system to this day. Within the past five years the Bell System has begun to lose some of this business to alternative satellite networks.

8.1.6 Telephotos and facsimile. (Type A)

The invention of facsimile preceded the invention of the telephone. Alexander Bain outlined the principles of telegraphic transmission of pictures in a British patent in 1843. Giovanni Caselli conducted experiments from 1863 to 1868. A French commercial effort was made in 1865. In 1875, a year before the telephone, William Sawyer made a breakthrough in better methods, and Arthur Korn made another breakthrough with a selenium cell optical scanner in 1902. Bell System research also played a role in advancing the art of sending graphics by wire to a practical and widely used one. In 1903, Lockwood, of the company's research staff, issued a report on telephotography, pointing out the many technical difficulties, but evidencing the company's interest.

By 1910 there was a regular news picture service among London, Paris, and Berlin. By 1925 telephotos were important in journalism.

8.1.7 Television and videophone. (Type A)

From the time of the invention of the telephone, the idea occurred to many people that if a voice could be captured and sent over wires, transmission of pictures was an obvious next step. The difficulties in going from conception to realization were frequently underestimated by non-technical people. The more naive and less scientifically sophisticated the writer, the more immediate the extrapolation from telephone to television seemed.

Kate Field, a British reporter associated with Bell, projected in 1878 that eventually, "while two persons, hundreds of miles apart, are talking together, they will actually *see* each other!"¹¹ That belongs in a class of journalistic whimsy along with the *Chicago Journal* suggestion:

Now that the telephone makes it possible for sounds to be canned the same as beef or milk, missionary sermons can be bottled and sent to the South Sea Islands, ready for the table instead of the missionary himself.¹²

In 1879, in *Punch*, the artist George Dumaurier . . . showed two people by a fireplace, watching a sporting match on a screen above the mantle. Sounds were transmitted by telephone.¹³

In 1902, Fawcett in "Successors of the Telephone," reported one of what was to become a long series of claims to have invented television, a device called by its "inventor," Philip K. Stern, a teloptoscope.¹⁴ In 1906 an issue of *Telephony* noted the invention by J.B. Fowler of the televue. Tested over a distance of 6,000 feet it could reproduce a picture of a scene placed in front of it including the colors of the objects in the picture.¹⁵ Fowler felt that he would revolutionize the art of telephony, but the manner in which he foresaw this, though it included entertainment, was divergent from what would occur first when the television was finally put to use.

Mr. Fowler confidently predicts that he can construct an instrument that will enable a train dispatcher (sic) to see all the trains on his division at one time, note their movements from one terminal to another, and therefore be far better able to prevent disastrous wrecks. The merchant can sit in his home and by utilizing this unique telephone see the interior of his store and watch the conduct of his clerks during his absence. Deaf mutes can carry on a conversation in the sign language over the televue and women can do their shopping by means of the instrument. . . . From this it is only a step to the time when a physician will use the televue to scrutinize a patient's tongue at long distance and then prescribe the necessary medicine over the wire.¹⁶

With these possibilities unfolding, it is no little wonder that the editorial in that issue of *Telephony* asks, if seeing and hearing are now possible on the telephone "will these two lead to the tasting and smelling and feeling telephone?"¹⁷ In 1910, Casson made a passing comment in an article on "The Future of the Telephone," to the effect that "there may come in the future an interpreter who will put it before your eyes in the form of a moving-picture."¹⁸ A more serious discussion of "The Future Home Theater" by Gilfillan, appeared in 1912. In some respects it is a remarkable forecast, in others a dismaying one.

There are two mechanical contrivances . . . each of which bears in itself the power to revolutionize entertainment, doing for it what the printing press did for books. They are the talking motion picture and the electric vision apparatus with telephone. Either one will enable millions of people to see and hear the same performance simultaneously, . . . or successively from kinoscope and phonographic records. . . . These inventions will become cheap enough to be . . . in every home. . . . You will have the home theatre of 1930, oh ye of little faith.¹⁹

Gilfillan believed that both the cable and over-the-air form of video broadcast would coexist by 1930, and also that there would be a television of abundance with libraries of recorded material from which one could choose. He thought great art would drive out bad; he described an evening program of Tchaikovsky, ballet, Shakespeare, educational lectures, and a speech by a presidential candidate on "The Management of Monopolies." He thought that the moral tone of the home theatre would be excellent. And he maintained that the difficulties in having all this were not technical but human.

By 1927 the Bell Laboratories demonstrated TV on telephone wires between New York and Washington, D.C., and over the air between New York and New Jersey.

President Walter Gifford of AT&T readily admitted that the elaborateness of the equipment required by the undertaking "precludes any present possibility of television being available in homes and office generally." For what, then, would television be used? Gifford could only say:

What its practical use may be I shall leave to your imagination. I am confident, however, that in many ways and in due time it will be found to add substantially to human comfort and happiness.²⁰

Following the first public demonstration of two-way television, Dr. F. B. Jewett, President of Bell labs, predicted further use, but felt that the wide transmission band, the high use of electrical power, and so forth would make television both difficult and expensive. Three years later President Gifford repeated that. "The future commercial possibilities of television are still uncertain."²¹

Two years later the *Bell Telephone Quarterly* again attempted to look at the future of television. Herbert Ives examined the cost of a channel and other economic considerations.

In image transmission for purposes of entertainment, . . . the element of simultaneity, which pertains to television in its strictist interpretation, is probably not necessary. . . .

If instead of carrying the motion picture film from place to place,

motion pictures could be transported electrically by a television system. the choice between the use of a home motion picture projector and a television apparatus receiving film images from a broadcasting station would depend entirely on the question of cost and convenience.²²

To Ives, whether recording of the television picture was done on-line or off-line was unimportant, for the need for real time simultaneity was not apparent.

In the early 1930s AT&T installed TV phone booths to test the market for commercial videophone service.

By 1938, when the Walker investigation of the telephone industry published its report, television already existed but had not yet reached the general public. The Walker Report projected two ways it could develop:

Television offers the possibility of a nation-wide visual and auditory communication service, and this service might be developed under either of two broad methods. The first is by the eventual establishment of a series of local television broadcasting stations similar to the present local radio broadcasting stations . . . or conceivably it may develop into some form of wire plant transmission utilizing the present basic distributing network of the Bell System, with the addition of coaxial cable or carrier techniques now available or likely to be developed out of the Bell System's present research on new methods of broadband wire transmission.²³

The one forecast the report did not make, and which now seems the most plausible, is that over time it would go first one way and then the other. With time unspecified, both forecasts may be realized.

8.1.8 The telephone network will become a teletype network too. (Type A)

In section 1.4.1 we noted the long history of alphabetic printing telegraphs going back long before the telephone. While these are in no way the offspring of the phone, the two technologies are so akin that repeated efforts have been made to put the two services onto one set of lines. Until recently, however, anti-trust policy prevented that from happening. The Kingsbury commitment of 1913 forced AT&T to divest itself of Western Union and to stay out of telegraphy. The close relation of the two technologies brought the phone company back in for one more foray in 1931 when it launched a teletype service. In section 7.2.3 we described AT&T's acquisition of the Teletype Corporation, the offering of TWX, and the eventual sale of it to Western Union in the 1960s forced by government under anti-trust action. In the last 15 years, with the development of computer networks, businesses

once more begun to use their phone lines to carry text between offices, and now value-added service vendors are offering this as a service over phone lines. The process now seems irreversible. The phone network has become the nation's teletype network too. Vail's hoped for merger of telegraphy and telephony into one utility company was indeed frustrated, but one of those is providing the network for the other.

8.1.9 Telephony leads to advances in sampling theory and statistics. (Type B)

Quality control was an important problem for a large system consisting of more or less independent franchised companies. In 1882 the new license contracts stipulated that

At all times during their manufacture and upon their completion the instruments and the materials employed shall be subject to the inspection and acceptance . . . by said first party (American Bell Telephone Company).²⁴

However, it was not until 1907 that the company attempted a rigorous, centralized quality control program. When that began, it required a scale of activities that could only be handled by sampling. As a result the Bell System became actively interested in sampling theory. Although the inspection function had been reorganized, its effect was minimal until more sophisticated and extensive quality control methods began to be developed in the mid-1920s.

The large telephone network had other statistical problems besides quality control. Before the turn of the century telephone companies became aware of marked diurnal rhythms in the use of the network, and of consequent peak-load problems.²⁵ Theoretical research into traffic control was undertaken by 1885 by G. T. Blood, E. C. Molina, and M. C. Rorty at the direction of Hammond Hayes. "The belief is common," wrote Rorty, "That, at the point where the human element enters a proposition, all recognized rules cease to hold."²⁶

Hayes' group, however, rejected that notion. They believed in the utility of mathematical research into behavior, and their work eventually led to significant improvements in trunking and switching operations. In 1905 Hayes set up a separate Traffic Division under K. W. Waterson in the AT&T Engineering Department.

Note also that T. B. Doolittle, starting in 1893 or 1894, headed a division doing analysis of toll traffic as a basis for investment decisions.²⁷ Later statistical research extended to such subjects as word frequency counts in telephone conversations.²⁸

8.1.10 Telephone system development stimulates research in city and regional planning. (Type B)

We have discussed in Section 2.1.7.2 the fact that about 1915 the telephone companies were the principle source of systematic demographic information on urban and neighborhood growth trends and characteristics. This data was collected partly by survey research methods; it contributed to the growth of a profession of planning.

8.1.11 Telephone system growth creates a need for advances in paper making and printing. (Type A)

Production of telephone directories presented mammoth printing problems. The volumes had to be cheap to permit free distribution. They had to be reprinted frequently because the system was growing rapidly, and because Americans are so geographically mobile.

Newsprint was the cheapest available paper, but the printing definition on it was poor, so fairly large type had to be used. To minimize the cost of phone books, it was desired to use the smallest legible type, but also cheap paper. To make that possible, telephone company researchers developed new types of low cost paper that would allow high definition with small type. They also made advances in printing technology including, for example, slugs that could be reused for the two-thirds of the entries that did not change between issues.²⁹

Directories had to be printed and distributed quickly so as to be up-to-date. The operators' phone books around 1940 were revised every two weeks in New York City, every two days in Los Angeles, and daily in Detroit. The average production time from closing the text to delivery to subscribers was 35 days at that time. There were only five or six printing plants in the United States that could handle the job.³⁰

8.2 The development of the telephone system as a stimulant to auxiliary businesses and services.

While the telephone is used in virtually every business, we shall here note a few of the services that are particularly reliant upon the telephone system for their operation.

8.2.1 Teleconferencing. (Type A)

In the United States, from a very early time, operators could and would set up connections among more than two parties.³¹ On various occasions demonstrations were put on of the possibility of holding a meeting among a group of people in different locations. Articles were written suggesting that these would become increasingly popular. While conference call service is

provided by AT&T, it has not become as popular or widely used as was sometimes anticipated.

Indeed, with the coming of electro-mechanical automatic switching the practicability of teleconferencing declined. It was not difficult for an operator to join several lines together. Automatic switches, however, were not built with that flexibility. In automatic systems the cost and difficulty of setting up conference calls is sufficiently great so that some systems, such as the Japanese system do not offer that service.

However, electronic switching is reversing that once more. A modern digital switch is a computer whose operations are governed by a stored program. In an SPC (stored program controlled) switch all sorts of complex operations can be added simply by modifying the software. The user can be provided with a set of input codes that will set up a multi-party call. Phone companies are, therefore, once more pushing conference calling as a new source of revenue—as fast as they move to digital switching. The computer switch will now do what the operator once did.

8.2.2 Information services. (Type A)

In the informal early days, the rural operator served as an information disseminator for anything of local interest. As systems grew and were formalized, rules came to govern what an operator was allowed to say. In different telephone systems specific information services were authorized. The most common ones were time and weather.³² by the end of the 1930s, in the U.S., time was still being reported by live operators. The weather reports were already recorded. Dilts tells us that in New York City in the late 1930s the weather report was getting 20,000 calls a day, and time 60,000.³³ Today the figures are weather 145,000 a day, time 129,000.

Such services were readily introduced wherever, as in New York, there was metered local service, for they brought additional business to the phone company. In some places where there was unlimited local service, these calls were given an exchange number outside the unlimited zone; otherwise the phone company would have no incentive to offer them. Such a service can also be supported by advertising or by a voluntary group with a message it wants to promote.

In other countries more extensive information services have been offered, ranging from the full broadcasting program of the Budapest system described in section 4.7.1 on down. Paris and Shanghai, for example, offer shopping information. Sweden offered recorded reports on skiing, sailing, and swimming conditions.

Various companies offered theatre information. The Bengal Telephone Company in Calcutta had a general information bureau which offered such information to British subscribers as Hindustani words or the boiling point of

water at different altitudes. Some U.S. rural phone companies offered various types of information for a while after the introduction of automatic dialing so as to reduce the trauma for their customers of the disappearance of the friendly operator.³⁴ However, since there was no way to collect revenue for such services, they tended to be abolished.

In most countries such information services declined as operators were eliminated, until the invention of recording on magnetic tape, after which such services revived. The growth of recorded messages including those offered by private organizations, like dial-a-prayer, is a development that took place after the period of our study, for such messages depend upon electronic telephone answering equipment.

8.2.3 Call forward. (Type A)

Some systems offered a service allowing calls to be routed to another number when the receiving party was elsewhere, or providing for taking of messages by the operator if there was no answer. Shanghai provided that service. Call forward is now being introduced by AT&T in electronic exchanges, but such service has been handled in the past primarily by separate small telephone answering companies that grew up to supplement the system.

8.2.4 Recording and secretarial services. (Type A)

The Stockholm system would make a wax recording of a long distance conversation for a fee. The Paris company had secretaries on hand to take dictation over the phone, and had messenger boys who would pick up and deliver written matter for the customers. In the United States such services have been established, but are offered (along with answering services) by private companies, not the phone company itself. A Cleveland entrepreneur set up a telephone stenographic service in 1904, called a "Telagirl" system.³⁵

8.2.5 Alarms. (Type A)

Burglar alarms, fire alarms, and storm warnings could be attached to the phone system either by the phone company itself or by other entrepreneurs. In Shanghai, for example, burglar alarm and typhoon warning services were offered by the phone company. In the section on emergency services (5.2.5, 5.2.6.1) we noted that various inventors and entrepreneurs developed alarms for use with the phone system.

8.2.6 Wake up. (Type A)

A morning call at a requested hour could be booked in many countries, for example Switzerland.

8.2.7 Taxi calling. (Type A)

In the U.S. today the usual system for getting a cab is a phone call to the taxi company, which in turn calls the cab by land-mobile radio. Before the days of land-mobile radio, and in countries where no such service is provided, the usual system is to have a phone in a street box at cab stands. The customer phones to a nearby cab stand.

8.2.8 Telephone marketing and polling. (Type A)

In sections 3.4.6 and 4.6 we described the use of the telephone in marketing and canvassing. Companies have been organized with a telephone bank in their premises to carry out such activities.

8.2.9 The telephone as a business "come-on." (Type A)

Before the general diffusion of coin telephones, and before the introduction of metered service, drug stores, cafes, and other merchants found it advantageous to allow potential customers to use the business' phone. By offering that favor they drew people in; alternatively, if a small charge were made the resulting revenue added to the merchant's income. The phone companies at first tried discouraging telephone moochers by writing in a clause against such activity in the contract and propagandizing against it in their ads. Needless to say, that was largely ineffective. The introduction of metered charges was a more effective stick against such generosity, and the introduction of coin phones with part of the revenue going to the premises was a more effective carrot.³⁶

Hotels soon put telephones in every room. For one thing it cut the manpower needs for bellboys. Before the phone, the bellboy responded to a call bell, came upstairs to learn what was wanted, went down to fetch it, and came back again to deliver it. After the telephone he needed to make only the one trip, bringing what was requested; the first trip to learn the nature of the request was eliminated.³⁷ Furthermore, the hotel could levy a surcharge on calls that guests made. By 1904 the Waldorf Astoria logged over half a million calls a year on its 1120 phones.³⁸

In 1912 Arnold Bennett wrote a series of articles in *Harper's Monthly* on a trip to the United States. One whole article dealt with the telephone as a pervasive feature of American society. He was astonished to discover a telephone in every hotel room. He was also shocked in a restaurant to have a telephone plugged in at his table. He predicted, "that on my next visit I shall find a telephone on every table of every restaurant that respects itself."³⁹ Bennett's prediction has proved wrong probably because the message charges on business phones and coin phone rate structure make the table phone economically unattractive to restauranteurs except in luxury restaurants.

The coin phone has remained a service for the convenience of customers, but the return is low enough so that increasingly, booths in the U.S. are put on the street rather than in stores.

8.3 The limitations of the phone system makes it the butt of humor and displaced aggressions. (Type B)

Particularly in the period of its' development, the telephone often worked less than perfectly. Thus users frequently expressed frustration at unintelligible sounds, squawks, and squeaks, crossed wires,⁴⁰ errors of recognition, late night phone calls, and wrong numbers. Sir William Thomson (later Lord Kelvin), commented enthusiastically on Bell's telephone at the Philadelphia exposition, but his remarks were largely devoted to noting which words were intelligible and which were not. The telephone, however, was then so novel that to produce anything intelligible was seen as a feat.⁴¹

Phone directories, in the early years, contained advice on speaking distinctly and directly into the mouthpiece.⁴² Ambivalence about the phone was expressed from the beginning. On March 5, 1877, the *New York Daily Telegraph* ran a piece called "The Terrors of the Telephone." One of numerous satirical articles poking fun at the difficulty of telephone conversation was by Mark Twain in a Christmas piece in 1890. "Twain," writes Bruce,⁴³ "had as great a reverence as any American for technology in general, including the telephone, which as early as 1877 he had used as the basis for a short story of the science fiction genre." Nonetheless with a humorous cut in his 1890 piece in the *New York World*, he wrote; "It is my heart-warm and world-embracing Christmas hope and aspiration that all of us—the high, the low, the rich, the poor, the admired, the despised, the loved, the hated, the civilized, the savage—may eventually be gathered together in a heaven of everlasting rest and peace and bliss—except the inventor of the telephone." When Gardiner Hubbard, Bell's father-in-law, remonstrated with him, he replied in humor that he was at war with the Hartford phone company. No man, he said, could make a 20 word message intelligible over it in less than week. "And if you try to curse through the telephone they shut you off."

"Outrages of the Telephone" in *Lippincott's magazine*⁴⁴ substitutes moralism for Twain's humor. It complains about "talkative people wasting one's time."

An article in the *Bristol (England) Times* on November 7, 1879 complains that businessmen who have phones are interrupted by business calls during dinner.

The intrusiveness of the telephone (cf. section 10.6.6) is commented on further in a *Literary Digest* piece of 1912 on the "Telephone and the Doctor."⁴⁵ It likens the telephone to a long stethoscope. "Its chief drawback is that, unlike the stethoscope, it is not so easily taken out of the ears, and it

brings him into communication with the world without when he would not, as well as when he would have it so." The following year the *Women's Home Companion*⁴⁶ discusses abuses of the telephone. One bereaved family had to have its phone disconnected because it could not make burial arrangements due to the sympathy calls. The previous month *American Homes and Gardens* had a piece on "telephone talk," also describing various annoyances and problems.⁴⁷

In the 1920s a popular phonograph record was "Cohen on the Telephone".⁴⁸ It had an immigrant Jew with a strong accent struggling unsuccessfully to make himself understood on the telephone. An extreme version of the complaints about the telephone came from a Germany psychiatrist in 1912 who claimed that telephone nervousness is a serious disorder. At least one patient, he claims, was so worked up by delays and unpleasant experiences that he was rendered permanently insane. "Excitable persons," he says, "should never use the telephone."⁴⁹

Another quaint objection to the phone was that of the National Conference of Old German Baptists, which ordered its members to stop using that "device of Satan," which makes people lazy, and for which "there is no warrant in Scripture."⁵⁰

FOOTNOTES

¹Clyde Jones in *Evolution of the Telephone*, in *Electrical Engineering*, 1893, noted the stimulus to scientific imagination represented by the telephone. Beyond the transmission of voice he anticipated video, and beyond that artificial eyes for the blind and "if life be but a manifestation of electrical energy" perhaps the secret of life (p.15).

²Dizard, *Business Planning and Telephone Research*, op. cit., p.24

³Ibid., p. 24.

⁴Bell Telephone Laboratories has done so in a multivolume series entitled *A History of Engineering and Science in the Bell System*, vol. 1, *The Early Years, 1875-1925*; vol. 2, *National Service in War and Peace, 1925-1975*. New York: The Laboratories 1975-1978.

⁵Cf. Waldon Fawcett. Successors of the Telephone. *Harper's*, Feb. 1902, 104, 496.

⁶Dilts. *The Telephone in a Changing World*, p. 183.

⁷Cf. The Transmiphone. *Telephony*, Nov. 1906, 12 (5), 288-89; Church and Theatre Service By Telephone. *Telephony*, June 1907, 13 (6), 414.

⁸Jos. P. Maxfield, The Vitaphone—An Audible Motion Picture, *Bell Laboratories Record*, June 1926, pp. 200-204.

⁹Cf. sections 1.4.5.2 and 4.7.2.3.

¹⁰Cf. Major-General George O. Squire's *The Unification of Communication Engineering*. *Scientific American*, Aug. 1922 127, 85, 142, 143. Also Wiley and Rice, *Communication Agencies and Social Life*.

¹¹Bruce. *Bell* p. 242.

¹²Dilts. *The Telephone in a Changing World*, p. 22.

- ¹³Erik Barnouw. *A Tower in Babel: A History of Broadcasting in the United States*. New York: Oxford University Press 1966, p. 7.
- ¹⁴Fawcett. Successors of the Telephone, p. 497.
- ¹⁵E.M. Rotherie. Seeing Through the Telephone. *Telephony*, 2, Aug. 1906, 12 (2), 96.
- ¹⁶Rotherie. *Seeing Through the Telephone*, Epp. 96–97.
- ¹⁷The Universal Telephone. *Telephony*, Aug. 1906, 12 (2), 130.
- ¹⁸Casson. The Future of the Telephone pp. 12916–17.
- ¹⁹S.C. Gilfillan. The Future Home Theatre. *The Independent*. Oct. 17, 1912, 73, 886–891.
- ²⁰The Television Demonstration. *Bell Telephone Quarterly*, July 1927, 6 (3), 198.
- ²¹Notes on Recent Occurrences. *Bell Telephone Quarterly*, July 1930, 9 (3), 227.
- ²²Herbert Ives. Picture Transmission and Television. *Bell Telephone Quarterly*, April 1932, 11 (2), 142.
- ²³Federal Communications Commission, pp. 238–39.
- ²⁴Dizard. *Business Planning and Telephone Research, 1875–1925*.
- ²⁵Cf. Angus S. Hibbard. A Phase of Telephone Engineering. *Electrical Engineering*, March 1894, 3 (3), 81–87.
- ²⁶Dizard. *Business Planning and Telephone Research, 1875–1925*, p. 18
- ²⁷Federal Communications Commission. *Investigation of the Telephone Industry in the United States*, 1, 88.
- ²⁸Frequency of Words Used Over the Telephone. *Science*, Supplement August 14, 1931, 74, 11–12.
- ²⁹Dilts. *The Telephone in a Changing World*, pp. 136–141.
- ³⁰Dilts. *The Telephone in a Changing World*, pp. 137–141.
- ³¹*Telephony* (April 1906, 11 (4), 243) in an article on “New Uses for Telephone” reported that the Billerica Board of Selectmen held a meeting by telephone during a storm; cf. Action At a Distance, p. 39.
- ³²Cf. John D. Holland. Speaking Clock For Announcing Time To Subscribers. *Telephony* Dec. 30, 1911, 61 (27), 807–8. The device there reported used 72 wax cylinders, each with ten minutes of announcements, including ads. It was receiving almost 10,000 calls a day in Chicago. It was economical only with automatic switching.
- ³³Dilts. *The Telephone in a Changing World*, pp. 126–128.
- ³⁴Dilts. *The Telephone in a Changing World*, pp. 130f.
- ³⁵The Telagirl System. *Telephony*, Aug. 1904:8 (2); cf. Telephoning to a Phonograph. *Telephony*, p. 127, June 1905, 9 (6), 514.
- ³⁶*Telephony*, in an article entitled “The Drug Store Pay Station Again,” (Sept. 12, 1908, 16 (5), 218) said that New Orleans druggist, by agreeing all together to substitute coin boxes for free use of their phones “have got rid of the free telephone nuisance.”
- ³⁷An ad for hotel phone systems is quoted by Cherry (“The Telephone System,” p. 119) from the *Melbourne Telegraph Electrical Society Journal* in the November-January, 1877–78 issue.
- ³⁸Aronson. Bell’s Electric Toy, p. 30.
- ³⁹Arnold Bennett. Your United States, Fourth Paper. *Harper’s Bazaar*, July 1912, 125, 192.
- ⁴⁰Cf. “Cross Wires,” a poem by Arthur Crawford, *Harper’s Bazaar*, Jan. 1913, 47, 50, which mixes several telephone conversations.

⁴¹Dilts. *The Telephone in a Changing World*, p. 4.

⁴²As late as 1913, the *Literary Digest* carried a description of an invention designed to improve the sound quality of a phone call by transmission the vibrations in the nose. For an example of how to use the phone see Angus S. Hibbard. How to Use a Telephone, reprinted in Brosseau, *Looking Forward*, p. 81.

⁴³Bruce. *Bell*, p. 285.

⁴⁴Minna Thomas Antrim. Outrages of the Telephone. *Lippincott's Magazine*, July 1909, 84, 126.

⁴⁵The Telephone and the Doctor. *Literary Digest*, 44, May 18, 1912, 44, 1037.

⁴⁶A.S. Richardson. "Telephone Courtesies" *Woman's Home Companion*, March 1913, 40, 43.

⁴⁷Other articles expressing people's antipathies against the phone include: The Problem of the Telephone. *Scientific American*, Feb. 17, 1883: 48 (7), Back To the Land—And the Telephone. *The Spectator*, April 7, 1906, p. 530; Andrew Lang. The Telephone and Letter-Writing. *The Critic*, June 1906, 48, 507–508; Telephone Manners. *Telephony*, Jan. 1907, 13 (1), 37; The Telephone. *Telephony*, no author June 8, 1910, 19 (2), 36; W.P., "P.S.: Telephonitis" *Lippincott's Magazine*, March 1913, 91, 377–78.

⁴⁸Mayer. The Telephone and Uses of Time, p. 240.

⁴⁹Telephone a Cause of Insanity. *Telephony*, Oct. 19, 1912, 63(16), 618.

⁵⁰Samuel G. McMeer. Digest of Telephone Literature. *Telephony*, Aug. 1905, 10 (2), 134–35.

9

The Telephone and Social Structure

9.1 The telephone provides a bond for communities. (Type C)

9.1.1 The operator becomes a community agent. (Type A)

In the days before the multiple switchboard the relationship of operator and customers became such that customers often gave presents to the operator for her kindnesses.¹ The significance of the operator to her subscribers is a point already stressed repeatedly in various contexts. We have talked about the operator in rural life (section 2.2.1.6) and the operator and information services (section 8.2.2). These points need not be repeated.² Let us note only that when the operator disappeared a significant hole was left in many communities.

9.1.2 The telephone reduces loneliness. (Type C)

Probably no other assertion is made more frequently or documented less frequently. It seems to commentators obvious beyond the point of needing documentation. Two serious studies confirm the obvious, but both are well outside our period: one is Wurtzel and Turner's analysis of reactions to loss of phone service following a fire in a New York exchange.³ The other is a study currently under way in Japan on the telephone in the life of women.⁴ Fiction about the telephone also reflects this basic effect. As Brooks points out,⁵ the lonely person clinging to the telephone in search of human contact is a repeated theme in song and story.

An interesting point made in *Recent Social Trends*, the report of the Commission set up by President Hoover, is the importance of the telephone directory in reducing social isolation.⁶

Particularly stressed in the literature on the telephone is the end of loneliness for the farmer and farmer's wife. (See section 2.2.1.1.)

9.1.3 The telephone increases social interactions. (Type C)

Numerous pieces by Mark Twain from 1878 on describe endless chatter on the telephone by housewives, adolescents, and indeed everyone.⁷ The growth of "chat" is viewed by some positively and by others negatively. Bell viewed it

positively. He wrote to his wife Mabel when the phone was less than two years old; "When people can . . . chat comfortably with each other by telegraph over some bit of gossip, every person will desire to put money in our pockets by having telephones."⁸ Others viewed idle telephone talk as a vice.

A telephone in a residence should be for the convenience of the user, for imperative needs, for exceptional social emergencies, where writing, sending, or going is quite impossible—for sudden illness, for bad weather, for unavoidable delays, for trains, or service of any sort. For these things it is indispensable but for the exchange of twaddle between foolish women, communications between the prowling wolf and the unsuspecting lamb, it has become an unmitigated domestic curse.⁹

Other pieces note the broadening of the range of people who can talk to each other. "Telephone" is a poem by Joseph Hubbard that appeared in the *Atlantic Monthly*¹⁰ which praises the instrument for its ability to put one in contact with anybody.¹¹

9.1.4. The telephone produces communities without contiguity. (Type C)

That thesis was put forward by Suzanne Keller in the telephone centennial volume.¹² Other papers in that volume, notably Thorngren's¹³ and to some degree Reid's¹⁴ question it. The thesis is that for the first time communities can develop, thanks to the telephone, among people who do not live close to each other; they can form communities based on shared tastes and interests though they do not meet.

Here we do not ask how far this is true. It is a hypothesis. What is relevant to note here, however, is that (with one exception)¹⁵ this hypothesis does not appear in clear form in the period before World War II. It is an anticipation that went beyond what people then were thinking about.

9.2 The telephone will provide a bond for family life. (Type B)

Occasionally in the 1930s one finds slight intimations of the reverse, particularly in sociological discussions. There is a tendency for social analysts to see some large sweeping trend in society and then to assume that all social forces work in that direction. One such broad trend that 20th century sociologists have repeatedly observed is the decline in the strength of family ties. Sometimes in writing about this an author would note the role of technological changes, noting the contribution to this trend of the automobile, the movies, contraceptives, etc. In such statements one sometimes finds the telephone mentioned in a list, but not discussed, for in fact if one examines it at all, it seems far more plausible that the telephone was a counter-force, providing a way of maintaining family ties.

Robinson, for example, in his *Improvement of Towns and Cities*, in 1901 noted the connection between telephone communication and family cohesion.¹⁶ When a family moved to the suburbs the telephone was of critical importance, as we noted in section 5.1, for it meant that the wife at home was not totally cut off from her commuting husband in town. In case of emergency he had a way of reaching her. So too, young families as they moved out of the center city or to other communities could remain in some contact with their parents. Earlier, the migrant was forced to leave his relatives virtually once and for all; not so after the telephone.

9.3 The telephone will provide a window on the world for the elderly as they became less active outside. (Type C)

One human interest story we came across makes this point, at least implicitly. It describes a house-bound old lady on a party line who spent her time listening in on all her neighbors and butting into their lives.¹⁷ The point was also made as early as 1879 in an article in *The Spectator* on “The Telephone Exchange.”¹⁸

Nonetheless, this proposition does not show up often in our literature search of the period before World War II, though it is widely recognized now. A possible explanation is that old people are not early adopters of innovations. In a period when the telephone was new, perhaps its active users were younger people. We speculate; we do not know. Another possible explanation is that the telephone was expensive; old people could rarely afford it.

9.4 Women and the telephone.

We shall not here repeat the points made above about the telephone and loneliness (sections 2.2.1.1 and 9.1.2) or the telephone and security (sections 2.2.1.2 and 5.1), except to note that these considerations are often said to be particularly relevant to women. While men would be apt to be out at work, in the early years of the telephone the woman would often be at home alone with her small children.

Whether for that reason or others, one of the most common remarks about women and the telephone is to allege a peculiar addiction on their part to its use.

9.4.1 Women talk longer on the telephone than men. (Type D)

Apparently it is a fact, not just a sexist stereotype, that women’s telephone conversations are longer than men’s.¹⁹ It certainly was the stereotype in fiction and essay ever since Mark Twain in 1880 wrote a sketch of a one-sided conversation of a woman on the phone.²⁰ The remarks are often savage like Twain’s quote on “twaddle between foolish women,”²¹ or friendlier but condescending like Arnold Bennett’s:

There [in the U.S.] a woman takes to the telephone as women in more decadent lands take to morphia. You can see her at morn at her bedroom window, pouring confidences into her telephone, thus combining the joy of her innocent vice with the healthy freshness of breeze and sunshine.²²

9.4.2 The use of women operators in manual exchanges significantly increases economic opportunities for women. (Type B)

Recently, the women's movement has altered employment patterns in the telephone business. AT&T's previous employment policy reserved operator's jobs for women, but allowed few women to reach executive rank. Today if one dials "0" one will often get a male voice. The lowered barriers represent progress for women today but at an earlier stage the reservation of jobs in a large and rapidly growing new occupation helped women to move into the big world.²³ At the turn of the century, if a young unmarried rural woman moved to the city, as millions did, her options were limited. Prevailing moral concepts made a sharp division between jobs in which she could retain her self-respect and those that forced her to work at a less desirable level. If she were educated she could be a teacher or nurse. If she had no special skills there were few options other than demeaning ones by the standard of the day, such as domestic service, waiting on table, or factory work. The opening up of jobs at telephone switchboards solved the problem for many young women. It was "one of the few trades in which woman workers are constantly . . . in demand."²⁴ It was work in an all female environment with no requirement to deal face-to-face with strange men. The phone company made the most of this attraction and featured the respectability of the job.²⁵

The level of pay also reflected the values of the day and of the market. The phone company praised it as good pay for an unskilled, unmarried girl, while labor called it exploitation.²⁶ Objectively speaking, there were few other equally clean and respectable unskilled jobs at that time that paid much better,²⁷ though clearly by defining the job as one for a young unmarried girl the companies were keeping their costs down.

In any case burgeoning telephone employment in exchanges and on PBXs, like secretarial employment slightly later, offered a path to self-support and independence for millions of women. As early as 1907, for example, the telephone system employed 42,000 men and 50,000 women.²⁸

9.5 The telephone and youth.

9.5.1 Young people will use the telephone more than their elders. (Type D)

The data on this piece of folklore is more mixed than that on women, but the

stereotype of the adolescent hanging on the phone is well established in the U.S.²⁹ It is not necessarily true that present figures on telephone use by age, of which there are some,³⁰ applied to an earlier era when phones were a novelty and luxury. Yet adolescent chitchat on the phone appears in literature early, just as does women's chitchat. On the other hand, data from other countries, such as Japan, where all calls are metered, show less access to the phone by children and adolescents. Parents control calls that cost money. The system of unlimited local calling fosters the social use of the phone and its use by young people.

9.5.2 The phone will allow mothers to keep tabs on children. (Type A)

Leaving a phone number with the baby sitter or telling the child "phone me if you are going to stay there" or "let me know when you are coming home" is so familiar today that one wonders how mothers survived when there was no way to know where or how their offspring were.

We cannot say whether the ability of mothers to keep track implies greater or lesser freedom for the young. It might allow mothers to relax the limits on where the child may wander or it might result in more effective restraint on the child. What it clearly does do is to ease the mother's anxiety.

9.5.3 The telephone is a channel for safe sexuality. (Type D)

From early on some writers were shocked to discover young people using the phone for conversations of a kind in which they would not engage face to face. We previously noted a 1909 tirade against use of the phone for "communications between the prowling wolf and the unsuspecting lamb."³¹ The same piece tells us that "impulsive women say things to men and to each other over the telephone that they would never say face to face." Four years later *Woman's Home Companion* comments "A young girl who would not think of standing on a street corner to converse with a boy will call him at his home by telephone and exchange idle nothings with him while members of his family pass comment on her lack of manners."³²

The obscene caller is exercising an extreme version of seeking a vicarious thrill in safety; he seems not to appear in literature in the era before automatic dialing; there may not have been quite enough safety then.

In the Victorian era the sexual significance of the phone was evidenced by the large number of jokes about untoward happenings on the phone and by sentimental stories about telephone romances. *The New York Tribune's* story (Nov. 4, 1876) on the phone at the Philadelphia exposition could come up with only two prospective uses for this new device, of which one was for a lover to pop the question to a lady far away.³³

FOOTNOTES

¹ Dilts. *The Telephone in a Changing World*, p. 107.

²But note also: Behind the Scenes at Central. *Booklover's Magazine*, Oct. 1903, 2, 390–401; Sylvester Baxter. The Telephone Girl. *The Outlook*, May 26, 1906, 83, 231–239.

³Cf. Wurtzel and Turner. Latent Functions of the Telephone, 246–260; section 5.1.

⁴Cf. Mayer. The Telephone and Uses of Time, p. 231.

⁵John Brooks. The First and Only Century of Telephone Literature. In Pool. *The Social Impact of the Telephone*. 213.

⁶President's Research Committee on Social Trends. *Recent Social Trends in the United States*.

⁷Mark Twain. A Telephone Conversation. Reprinted in Charles Neider (Ed.), *Complete Humorous Sketches and Tales of Mark Twain*. New York: Doubleday, 1961. Brooks. The First and Only Century of Telephone Literature.

⁸Quoted in Bruce, *Bell*, p. 210. Cf. Briggs. The Pleasure Telephone, for a discussion of the significance of "chat" and quotations about it.

⁹Antrim. "Outrages of the Telephone," *Lippincott's Magazine*, July 1909, p. 126.

¹⁰Joseph Hubbard. Telephone. *Atlantic Monthly*, Sept., 1914, 114, 330–331.

¹¹Cf. Cherry. The Telephone System, p. 119, on democratizing of contacts.

¹²Suzanne Keller. The Telephone in New (and old) Communities. In Pool. *The Social Impact of the Telephone*, 293.

¹³Bertil Thorngren. Silent Action: Communication Networks for Development. In Pool. *The Social Impact of the Telephone*, 282–83.

¹⁴A.A.L. Reid. Comparing Telephone with Face-To-Face Contact. In Pool. *The Social Impact of the Telephone*, 346–411.

¹⁵Cf. Arthur Page's comment: "A man's neighbors are now more the people of his choice than those who happen to 'live next door.'" (Page. *Social Aspects of Communication Development*, p. 21.)

¹⁶Robinson. *Improvement of Towns and Cities*.

¹⁷Harriet Spofford. A Rural Telephone. *Harper's Monthly* May 1909, 118, 830–837.

¹⁸The Telephone Exchange. *The Spectator*, Sept. 20, 1879, 52, 1188.

¹⁹Mayer. The Telephone and Uses of Time, p. 231.

²⁰Mark Twain. A Telephone Conversation.

²¹Antrim, Outrages of the Telephone, *Lippincott's Magazine*, July 1909, 84, 126.

²²Bennett. Your United States, Fourth Paper, p. 192. Cf. Back to the Land— And the Telephone. *The Spectator*, April 7, 1906, p. 530; Page. *Social Aspects of Communication Development*, p. 23.

²³Brenda Maddox, Women and the Switchboard, In Pool. *The Social Impact of the Telephone*.

²⁴Good Points and Bad Points of Telephone Operating As a Trade for Philadelphia

²⁵There were also numerous stories on how good were the prospects of the operators for matrimony, and the implications of that for labor turnover. Men were reportedly con-

²⁵There were also numerous stories on how good were the prospects of the operators for matrimony, and the implications of that for labour turnover. Men were reportedly constantly falling in love with the unseen voice. Cf. Cupid Cripples Muncie "Central". *Telephony*, Aug. 1904, 8, (2), 123.

²⁶Anne Withington. When the Telephone Girls Organized. *The Survey*, Aug. 16, 1913, 30, 621-23.

²⁷Cf. Switchboard Positions in Demand. *Telephony*, Nov. 1905, 10 (5), 363.

²⁸Mumford. This Land Of Opportunity. The Industry's perspective is given in an article—Telephone Operators Hard To Get. *Telephony*, June 1905, 9 (6), 485—which discusses the increasing difficulty in securing and retaining the right kind of female labor. It discusses incentives, training schools, and perceptions of the relative merits of different ethnic groups. Morale building paeans to "The Telephone Girl" were also common. Cf. Sylvester Baxter. Telephone Girl. *The Outlook*, May 26, 1906, 83, 231-39, also *Telephony*, Jan. 1907, 13 (1) 37.

²⁹See McLuhan. *Understanding Media*, p. 233.

³⁰See Mayer. The Telephone and Uses of Time, pp. 229ff.

³¹Antrim, "Outrages of the Telephone" p. 126.

³²A. S. Richardson Telephone Courtesy. *Women's Home Companion*, March, 1913, 40, 43.

³³It added "it is not for us to guess how courtships will be carried on in the Twentieth Century." Other romantic discussions of the telephone include: Heard on the Party Line. *Telephony*, July 1904, 8 (1), 75; Long Distance Telephone Weddings. *Telephony*, Aug. 1904, 8 (2), 117; The Secret Service. *Telephony*, June 1907, 13 (6), 415 on the advantages for lovers of dial phones without operators. *The Spectator*, April 7, 1906, suggested "that a new method of rustic courtship may be added to the three stages already existing"—walking-out, courting, and being engaged—namely "talking."

10

Social Customs and Practices

10.1 Telephoning for appointments will become customary. (Type A)

In writings about the tradeoff between visiting people in person and phoning, it is often forgotten that one of the main uses of the telephone is to arrange appointments. Almost every visit today requires at least one phone call first.

In the days before the telephone, custom allowed one to visit unannounced to pay one's respects; at certain times the house had to be prepared for such guests. If no one was home, or if the residents hid upstairs, the caller would leave a card. That kind of visiting was effectively ended by the telephone.

For other more formal occasions it had been customary to send written invitations to which a written reply was expected. Various observers noted and some deplored the tendency to substitute a phone call.¹ Hendrick noted that in 1914 White House wedding invitations were by phone.² The previous year, Anna Seese Richardson in the *Woman's Home Companion* complained about the impoliteness of a phoned acceptance of an invitation and warned that phoned invitations taken as messages may not get delivered, or if not noted down may be forgotten.³

10.2 Codes of telephone courtesy will develop. (Type B)

Etiquette books and articles advised on how to answer the phone.⁴ Normal conduct did not always correspond to the advice being given. For example, people were repeatedly exhorted not to say "hello" but to identify themselves, for instance, "Mrs. Smith calling."⁵ They rarely did.⁶

Profanity was one topic harped upon in discussions of telephone manners.⁷ A female operator on the line was considered to require callers to avoid bad language. Phone companies sometimes cut off service to those who swore. It will be recalled that one of Mark Twain's complaints was against the Hartford company's efforts to control his language. In 1904 a Paris journalist was fined for using strong language to the "demoiselle de telephone." He refused to pay; the police seized his furniture and the case because a *cause celebre* in the Chamber of Deputies.⁸

10.3 Telephone manners will tend toward informality. (Type B)

The decline of written invitations, the willingness of people to say things they would not say face to face, the ambiguous greeting “hello” before the speaker is identified, the fact that anyone may answer the call, master or servant, male or female, young or old, all tended in the direction of breaking down some of the older formal conventions of social interaction. Mrs. C. S. Peel,⁹ reviewing social life before World War I, wrote that the “telephone has helped . . . make life less formal.”

10.4 Conventional styles will develop for telephone conversation. (Type B)

Serious analysis of the linguistic or structural patterns of telephone conversation do not appear early. The styles of conversation, however, in various literary passages, give testimony to the presence in early telephone practice of forms which have been analyzed more recently.¹⁰ Thus phone conversations generally begin by the receiver of the call saying “hello” upon picking up the phone.¹¹ The caller then replies “hello” and adds any one of several phrases which Schegloff has analyzed and categorized. These include such items as “How are you?” or “Is John in?” The striking point is that in calls among friends, both parties are reluctant to identify themselves first; the caller tries to lead the receiver to recognize the caller by voice and context. When the receiver has recognized the caller, the response is generally “hello, Mary” or whatever the caller’s name may be. A psychological theory of this caution about self-identification in the absence of sight has not yet been offered, nor have these American findings been examined cross-culturally.

There are also conventions for situations like wrong numbers. Most people expect the caller to state the number he wanted to reach (“Is this 458-9921?”) rather than for the receiver to state the number reached. To reveal the number reached is believed to provide some valuable information to a malevolent caller, although presumably he already knows well the number he dialed. So the convention arises more from psychological guardedness than from any rational analysis of risks.

There are also conventions for terminating telephone conversations. Most people feel that they have been rude if they take the lead in closing a call that they received. That should be done by the caller.

10.5 The quality of letter writing will decline. (Type C)¹²

Anna Richardson comments in 1913 that “In a household where the telephone habit has gripped the rising generation it is not unusual to hear the daughter beg their mothers or aunts, or even grandmothers, to help them compose

a simple note of congratulation or condolence."¹³ The decline in writing skill was a common complaint.¹⁴

10.6 The telephone increases and decreases privacy. (Type C)

As we noted in the introduction, we do not know which way the net effect of the telephone went; in some ways it increased privacy, in other ways it decreased it;¹⁵ its net impact is unclear.

Concern about privacy has been present all through the century, though it tended to be subdued in discussing problems where it seemed nothing could be done about it, and more active when ways of protecting it became apparent. For example, the issue of privacy loomed large in the earliest days of wireless telegraphy, since people then realized that there was a choice between sending messages over a wired rather than a wireless system. In 1899 J. A. Fleming, a wireless pioneer, published an article on the "scientific History and future Uses of Wirless Telegraphy" in *North American Review*.¹⁶ He concluded that wireless "will never replace entirely telegraphy with wires, because the use of the continuous wire secures a privacy not otherwise to be obtained."

Yet when over-the-air transmissions came to be used for ship communications right after the turn of the century, for police car communications twenty years later, for transatlantic phone calls in 1927, for microwave long-lines circuits since World War II, and for satellite communications now, it has been only under the most extreme circumstances that users have worried about invasion of their privacy or tried to do anything about it. Some sensitive business transactions are coded. For the last few years the federal government has put its domestic national security traffic on cable rather than on microwave circuits, because it established that the Soviet Embassy was listening in. But on the whole the revealed consumer preference for spending money on privacy is rather small. Most people will not spend much to reduce the risk that someone is listening to them.

Indeed, the behavior of people in phone booths or on the street shows an unparanoid assumption that the people passing by who can certainly overhear their words, are neither paying attention nor trying to listen in. The simple and effective Hush-a-Phone type of device that surrounds the mouthpiece with a muffler has not taken hold.

So if telephonic invasions of privacy have occurred (as they have), it is at least in large part because users chose not to do what they could have done—at a cost—to protect themselves. Nonetheless, when violations of the public's basic trustfulness have been exposed in bugging scandals, the American public has turned indignant,¹⁷ and of course some individuals of a secretive temperament have been suspicious of surveillance all the time.

The real effect of the telephone on privacy has not been that of the phone as an abstract concept, but that of the phone system as it was actually built, with its

various protections and lacks of more protections. The net effect on privacy probably did not deviate very far from what people were used to, for if it had there was plenty of opportunity to enhance the security of the system, or conversely to save money by reducing security. So the system could always move to a preferred equilibrium.

The ways in which the phone system both increased and decreased privacy were not inevitable but were features of the system as it worked in practice.

10.6.1 Party-Line phones require people to converse in the hearing of others. (Type E)

For many years party-line listening-in was a basic feature of rural life repeatedly joked about or treated in fiction.¹⁸ The very first known telephone ad issued by Gardner Hubbard in May 1877 pointed out that “the use of more than two phones on the same line where privacy is required is not advised.”¹⁹ Inventions were made and promoted to prevent party-line listeners, for instance to signal the callers when a third receiver was raised.²⁰

These issues, of course, vanished as open party lines disappeared.

10.6.2 Operator attended calls can be heard by the operator. (Type B)

This kind of possible scrutiny of one’s conversations passed with automatic dialing.²¹ Pending that, various states passed laws prohibiting phone company employees from revealing what they heard.²² These laws followed a well established precedent of laws sealing the lips of telegraphers.

10.6.3 Concern about telephone tapping will rise if the likelihood of actual listeners-in declines. (Type B)

No great outpouring of indignation about telephone tapping occurred in the days when operators could listen in if they had any reason to, and in which neighbors too could listen in on party-lines.²³ Dilts, for example, as late as 1941, wrote in praise of the FBI that it “knows the science of wiretapping thoroughly.” She adds that “When calls are made between high ranking officers of our State Department and the heads of other governments the full force of surveillance is always in play.”²⁴ At that time such practice seemed normal enough and not something to be mentioned only in criticism. Earlier, the Supreme Court in the case of *Olmstead et. al. v. U.S.* (48 Sup. Ct. 564, 1928) rejected the defendants’ attempt to have evidence collected by a tap thrown out as in violation of the Fourth Amendment on searches and seizures and the Fifth Amendment on compulsory self-incrimination. Chief Justice Taft, in a decision that has since been overturned, ruled that there was no compulsion; the defendants were “voluntarily transacting business without knowledge of the interception.” As to the Fourth Amendment he said that unlike the opening of sealed letters, “there was no searching. There was no

seizure. The evidence was secured by the use of the sense of hearing, and that only.”

Yet wiretapping was a matter of some concern even then. Brandeis and Butler wrote dissents to Olmstead. In his dissent Brandeis pointed out that 25 states had enacted statutes since 1912 prohibiting the interception of messages sent by telephone and/or telegraph, and that 35 states, starting in 1910, had made it a criminal offense for telephone and/or telegraph companies or their employees to disclose the content of messages.²⁵

Concern about governmental wiretapping, however, grew in the era of automatic dialing, at which time people tended to assume that their conversations could be, and therefore should be, impervious to listeners-in. In 1944 the *Bell Telephone Laboratories Record* noted a growing concern over governmental recordings of conversations. In the 1960s and 1970s, this concern became a major public issue. There is far more concern than ever before about “big brother” watching each of us.

10.6.4 Every individual will be given a unique ID number to facilitate telephone service. (Type A)

In 1910 Casson²⁶ reports (without alarm or shock) that the phone company is working on a scheme to give each person a unique ID number, which would make it possible to phone to a person, wherever he happened to be located at that moment, instead of phoning to a number representing nothing more than a handset in a fixed location; the person we want to talk to might or might not happen to be there.

Something like the scheme that Casson described, which was quite impractical with electro-mechanical automatic switches, is now becoming possible with electronic Stored Program Controlled (SPC) switches. Many subscribers on SPC exchanges have opted for “call forward” service which allows them, when they are not at their usual number, to specify the number where they will be and to have the call transferred there. That still does not require a number for the individual, but only for each phone. However, it is a practical software modification to allow an individual like a travelling salesman to subscribe to a personal number and then to notify the SPC common-control system of the phone number he is at each time he moves. His office or other caller could then call him by entering his personal number and the system would find him, wherever he might be.

That is, of course, a purely voluntary system to which the customer chooses to subscribe and therefore quite different from a universal compulsory ID.

A required ID Number for each individual is the nightmare of contemporary civil libertarians and has long since been dropped from phone company planning. It would arouse too much fear that the number might become a universal ID used for all sorts of tracking, as indeed the phone number has sometimes become for family units.

10.6.5 Phone numbers will be used for identification and credit checking. (Type A)

This is not a development that we find anticipated in writings from before World War II. Yet it has happened. By now to open a charge account, get a credit card, or even cash a check, one must usually provide one's phone number. Use of phone numbers for such purposes would not have been nearly as feasible in the days before telephone penetration became virtually universal.

10.6.6 The telephone will be highly intrusive into domestic peace. (Type C)

Very few people can let the phone ring without answering it. From Mark Twain on,²⁷ people have commented on the imperious character of the phone bell, or upon the difficulty of hanging up.²⁸ The caller has no way of knowing what he is interrupting. The receiver no way of knowing who is calling or why. That too may change in future digital networks with common control signalling, for the information on the calling number can be retained and displayed on a screen at the receiving phone. But that is for the future. Until now the telephone's ring has remained an imperious command from one knows not whom.

Rice and Willey commented in 1933 that "personal isolation—inaccessibility to the demands of others for access to one's attention—is increasingly rare, or, when desired, increasingly difficult to achieve." They tabulated the average interval between incoming messages received by the average individual through different media in 1907 and 1927, and discovered that the telephone "is by far the most intrusive of the several agencies," and increasingly so.²⁹

On the other hand, as we noted in section 10.1, the phone has decreased the incidence of unannounced visits. It is hard to balance the usually brief and in any case less upsetting requirement to handle phone calls against the rarer but more involving event of a surprise visit.

10.6.7 The telephone permits communications about sensitive matters without commitment to writing. (Type A)

The decline of written records was noted previously in section 4.2.3; the decline in letter writing skill was discussed in section 10.5, and in the next chapter we will note the consequence for historians (section 11.3.2). Here we discuss the decline in written communication in relation to its special consequence of helping avoid the creation of potentially embarrassing written records.

H. G. Wells noted this in 1902. "The businessman may sit at home . . . and tell such lies as he dare not write."³⁰

Thus in some respects the phone has promoted privacy while undermining it in others, and it has done each to different degrees at different stages of the development of the technology.

FOOTNOTES

- ¹ Cf. W.P. "P.S.: Telephonitis" *Lippincott's Magazine*, 1913, 19, 337.
- ² Hendricks. Telephones for the Millions.
- ³ Anna Steese Richardson. Telephone Courtesy. *Woman's Home Companion*, March 1913, 40, 43.
- ⁴ Etiquette on the Telephone. *Telephony*, Sept. 1906, 12 (3), 186-7.
- ⁵ Bad Telephone Manners. *Telephony*, Aug. 1904, 8 (2), 130; Telephone Courtesy. *Telephony*, July 1904, 8 (1), 32.
- ⁶ Telephone Good Form. *Telephony*, Sept. 1907, 14(3), 138.
- ⁷ Bad Telephone Manners. *Telephony*, Aug. 1904, 8 (2), 130.
- ⁸ Telephone Agitation in Paris. *Telephony*, Aug. 1904, 8 (2), 135.
- ⁹ C.S. Peel. *A Hundred Wonderful Years: Social and Domestic Life of a century, 1820-1920*. New York: Dodd, Mead, 1927, p. 8, quoted in Perry. *The British Experience, 1876-1912*. Cf. Richardson. Telephone Courtesy; Telephone Good Form. *Telephony*, Sept. 1907, 14 (3), p. 138.
- ¹⁰ For a recent examination of telephone style see Schegloff. Identification and Recognitions in Interactional Openings. In Pool. *The Social Impact of the Telephone*.
- ¹¹ Telephone Good Form. *Telephony*, Sept. 1907, 14 (3), 138.
- ¹² Cf. Section 4.2.3 and 11.3.
- ¹³ Richardson. Telephone Courtesy.
- ¹⁴ Cf. Andrew Lang. Telephones and Letter Writing. *The Critic*, June 1906, 48, 507-508.
- ¹⁵ Cf. Ogburn. *Technology and International Relations*, pp. 282.
- ¹⁶ J.A. Flemming. May 1899, 168, 630-40. Scientific History and Future Uses of Wireless Telegraphy. *North American Review*.
- ¹⁷ In other democratic countries such as France and Italy the public's reaction to government bugging seems to be more fatalistic. And in non-democratic countries it is of course assumed, even if resented.
- ¹⁸ Cf. Dalton Trumbo. *Johnny Got His Gun*. New York: Monogram Publishers, 1939. Brooks, "The First and Only Century of Telephone Literature."
- ¹⁹ Reproduced in *Telephony*, July 1904, 8 (1), 65.
- ²⁰ Baird Secret-Service Telephone. *Telephony*, Aug. 1905, 10 (2), 179; More Trouble For Telephone Listeners. *Literary Digest*, Nov. 21, 1914, p. 1005; Frank G. Moorhead, To Stop Telephone Eavesdropping. *Literary Digest*, Oct. 17, 1914, p. 733; Improving Telephone Service. *American Architecture*, Dec. 18, 1918, 114, 753.
- ²¹ Also, devices were invented to prevent operators listening. Cf. L.W. Stanton. The Telephone System of the Future. *Scientific American Supplement*, May 19, 1906, 61, 25, 399.
- ²² Eavesdropping Must Stop on Telephone Lines in Ohio. *Telephony*, April 10, 1909, 17 (15), 446. Cf. section 10.6.3.
- ²³ But see Lang. Telephones and Letter Writing.
- ²⁴ Dilts. *The Telephone in a Changing World*, pp. 83ff.
- ²⁵ In addition the series of devices that we noted earlier to provide privacy on party lines and against eavesdropping or tapping. Cf. Fawcett Waldron, How Uncle Sam Uses the Telephone. *Telephony*, Jan. 22, 1910, 19 (4), 90; Secret Telephone. *Scientific American*, Dec. 5, 1919, 121, 555, on scrambling.

²⁶ Casson. *Future of the Telephone*, pp. 12903ff.

²⁷ Cf. section 8.3; McLuhan. *Understanding Media*, p. 235.

²⁸ Richardson. *Telephone Courtesy*, p. 43.

²⁹ See p. 93, fn. 58, Willey and Rice, *Communication Agencies and Social Life*, p.152. The telephone call receipt rate per person was one call every 3 days in 1907, one every 1-1/2 days in 1927. Letters came next in february.

³⁰ Wells. *Anticipations*, p.66.

11

The Telephone in Relation to Learning and Culture

11.1 The Telephone and Science and Technology.

Section 8.1 of this report was devoted to telephone related research and development and its results in producing technological progress. Some of the topics we discussed there, such as the development of statistical or city planning methods, could also fall under this topic.

The order of treatment is arbitrary, and we shall not repeat those points again. Some additional points have been made by various authors about the telephone's contribution to science and technology through learning and culture rather than through specific telephone research and development activities.

11.1.1 The telephone system will create employment openings for the college trained. (Type C)

That was a fairly central point in John Kimberly Mumford's 1908 article on the telephone, entitled "This Land of Opportunity".¹ He stresses the complexity and sophistication of the system and its dependence on high quality management. And so, Mumford reports, AT&T had begun systematic recruitment of college graduates. Mumford attributes the increased evaluation of a college education not to the phone company alone, but to the management needs of large corporations in general. He quotes Carty:

The corporations are standing at the doors of the colleges with their hats in their hands . . . It's the trusts that have brought this condition about. It was no longer a question whether the graduate could get a job or not. The question was which job he would condescend to take.²

The telephone opportunities were greatest for those graduates with technical training. Said Carty:

The Western Electric Company . . . was first to recognize the utility of college men as recruits in the engineering field. It began as far back as

1875 [before the phone!] to take a few of the best men from graduating classes and put them to work at \$10 a week.³

11.1.2 The telephone system contributes to the establishment of the profession of electrical engineering. (Type C)

Electric power and telegraphy were developing at the same time as telephony; radio developed shortly thereafter. Among them they created what is now one of the larger professions. In 1882 MIT started teaching electrical engineering and by 1884 the first such departments were established at Cornell University and at Stevens Institute of Technology.

11.1.3 The telephone will stimulate interest in science. (Type C)

The latter part of the 19th century was a period of wide lay enthusiasm for science. Public lectures on science attracted large audiences. In London, the Royal Institution drew from the cream of the society for its Friday lectures. Graham Bell turned to giving public lectures on the telephone as a way of supporting himself and his work in the first couple of years after his invention. There was a wide popular interest in the miracle of the phone and how it worked.

As the phone became an everyday fact of life, particularly after 1915, lay publications about the phone, interest in it, and indeed understanding of it declined. That, however, was not what the earlier commentators predicted. They expected an ever growing interest and enthusiasm as the phone became more pervasive. Indeed, Casson in 1910 predicted that one of the social consequences of the phone would be a growing popular understanding of the scientific principles on which it works.⁴

11.2 The telephone will facilitate dissemination of knowledge. (Type A)

Among those early commentators who foresaw the telephone being used as a broadcasting mass medium, many expected it to be a powerful force for the dissemination of education and culture. S. C. Gilfillan's 1912 forecast of video courses carried by phone lines is one of the fuller descriptions.⁵

The expectation of broadcasting by telephone has, of course, not materialized. The telephone is used on a small scale for education of shut-ins and for remote schools.⁶ It is also very actively used in the mass media as noted in section 4.7.2. Computer networks are a new and very important use of the telephone which could not be anticipated in the period we are studying. Beyond that the role of the telephone in scientific and educational institutions has been significant in more or less the same ways as in other large institutions, rather than in the ways anticipated.

11.3 The telephone will reduce emphasis on writing and increase emphasis on oral communication. (Type C)

11.3.1 The telephone will lower emphasis on writing skills in the schools. (Type C)

In sections 10.5 and 4.2.3 we noted a decline in the quality as well as quantity of letter writing both in institutions and in personal life. A decline of skills in handwriting and other writing skills has also often been noted. Attribution of the decline in letter writing to the telephone was common, but we do not find explicit discussions of how that decline in letter writing affected emphasis on writing in the schools. This forecast of a change in educational priorities was apparently not made on the record.

11.3.2 The decline in letter writing reduces the record available to historians. (Type C)

This forecast, often put forward in recent years, was apparent on the record only late in the period we are studying. In 1935 Hector Bolitho wrote an article on "the Telephone and the Biographer"⁷ in which he deplores the effect of the phone in making detailed reconstruction of a famous person's life or of negotiations almost impossible. In general, most early analyses tended to carry inferences only one step. They saw a decline of letter writing resulting from the use of the telephone. They rarely asked the next question, what a decline in letter writing would do in turn.

11.3.3 Writers of fiction and drama will use the telephone as a symbol and as a mechanism for moving the dramatic action. (Type D)

This proposition too was not seriously discussed until recently, though the frequent appearance of the telephone in song and story was recognized. The nature of this coverage has been analyzed by Brooks.⁸ He finds that the telephone appears more in the period before World War II, when it was novel than recently when it is taken for granted.⁹ In the earlier period the phone sometimes symbolizes the eerie and the supernatural.¹⁰ Often the phone is used in plays to overcome the locational limits of a stage. Monologue into a telephone (like Twain's 1880 piece) was a new device for the writer, and one that required virtuosity in capturing a novel style of language.

11.3.4 The style of telephone conversation will modify the language. (Type C)

General Carty asserted in 1891 that telephone and telegraph had affected the use of language, creating a "telegraphic brevity," and he expected the use of

recordings instead of written letters to improve elocution.¹¹ In 1905 *Telephony* predicted that in 50 years the phone system of numeration would be in use throughout. For example the number 2,884,377 would be read in the same manner as one would read a phone number: “number two double eight, four, three, double seven.”

Teacher—Johnny, what is the product of one double two nine by eight double seven?

John (after due time)—one, O, double seven, double three.¹²

Telephony frequently made reference to the emerging changes in the use of language.

That the telephone is giving the American voice a tone of culture and refinement, is the assertion of students who have investigated the subject. The result which generations of “finishing schools” have been trying to accomplish has been secured for young women in a few years by the telephone.¹³

The reader may recall that in section 4.1.1 on the disappearance of dialects we quoted Edward J. Hall, president of the Southern Bell Telephone and Telegraph Company, as saying there will be no dialects—no southern, no northern, no western accent—but instead just “one harmonious American language.”¹⁴

Telephony in the same issue suggested “that a constant use of the telephone may improve enunciation and produce a sharp, clear cut conversational tone” among operators and others who talk on the phone continually, but “that its use can bring about any such desirable reformation in the man who talks into it perhaps a dozen or twenty times a day for three or four minute periods is not very probable.” The following year, however, it quoted the head of the Voice Department of the Emerson College of Oratory in Hopkinsville, Kentucky predicting that because of the telephone the next generation or two would develop clear, precise enunciation¹⁵ Dr. Frank H. Vizetelly, editor of *The New Standard Dictionary*, is quoted in the *Bell Telephone Quarterly* in 1930 as expressing “the great debt we owe these (telephone) companies for their efforts on behalf of standardized speech.”¹⁶

In these comments from trade journals the emphasis is on the good things telephony may do for oral speech, rather than on any deleterious effects on formal or written speech, but in any case there is recognition of an impact.

FOOTNOTES

¹ John Kimberly Mumford. This Land of Opportunity, The Nerve-Center of Modern Business, *Harper's Weekly*, Aug. 1, 1908, 52, 22–24.

² *Ibid*, p. 23.

³ Mumford. *This Land of Opportunity*, p. 23.

⁴ Casson. *The Future of the Telephone*.

⁵ Cf. section 8.1.7; Gilfillan. *The Future Home Theatre*.

⁶ Education By Telephone. *Telephony*, 1904, 8, 25. Cf. Paladugu V. Rao. Telephone and Instructional Communications. In Pool. *The Social Impact of the Telephone*.

⁷ Hector Bolitho. The Telephone And the Biographer. *The Spectator*, July 19, 1935, 155, 90–97.

⁸ Brooks. *The First and Only Century of Telephone Literature*.

⁹ In its early years *Telephony* would run a short story about the telephone every few issues. It also ran numerous human interest anecdotes, usually turning on the peculiarities of telephone conversation. Cf. *Telephony*, Dec. 1902, 2 (6), 268f; Aug. 1904, 8 (2), 130.

¹⁰ It will be recalled that Mark Twain wrote a science fiction story based on the phone as early as 1877.

¹¹ The Prophet's Corner, *Electrical Review*, Aug. 29, 1891, 19 (1), 2.

¹² Numeration by the New Plan. *Telephony*, July, 1905, 10 (1), 77.

¹³ Telephone Makes the Voice Soft. *Telephony*, Nov. 1905, 10 (5), 360.

¹⁴ The Telephone Voice. *Telephony*, June, 1906, 11 (6), p. 382, quoted in Section 4.1.1.

¹⁵ *Telephony*, Jan. 1907, 13 (1), 13.

¹⁶ W.P. Banning. Better Speech. *Bell Telephone Quarterly*. April 1930, 19 (2), 80.

12

Conceptions of Self and Universe

We close with the most abstruse effects of the telephone and the hardest to identify, namely its effects, if any, on peoples' thoughts. Does the ability to conquer distance give people a sense of power? Does it generate hubris about human ability to conquer nature? Does it, as Erwin Canham suggests, give "man the attributes traditionally assigned to the deities: omnipresence, omniscience, omnipotence."¹ Such questions are much harder to answer than the ones with which we have dealt so far. Up to now we have traced the impact of a tangible physical device the telephone. One can observe how people use it, when they call, when they do not, whom they seek to reach, and how much time and money they spend on it. Those are empirical facts. Now we turn to a different kind of question, a question about the impact on people's thoughts of the Platonic image of the phone which they had in their minds. That is far harder to fathom.

Yet some such propositions about the telephone and conceptions of self and universe did appear in the literature.

12.1 The telephone will foster sociability and cooperativeness. (Type C)

These are the words of Herbert Casson; in 1911 he said the telephone "has enabled us to be more social and cooperative. It has literally abolished the isolation of the separate family."²

12.2 The telephone will foster impersonality. (Type C)

The introduction of phone numbers³ led to some resentment of the impersonality of telephone relations. There were articles on how to remember telephone numbers.⁴ There were also numerous comments on the inadequacies of contacts in which smiles and expressions could not be seen.

12.3 The telephone will change people's sense of distance. (Type C)

This point is but a corollary of the various points made about the ability of the telephone to conquer distance (Cf. sections 1.3., 2.1.6, 3.1.1, 4.9). Presumably

these points may have profound psychological aspects too. Do people who have grown up from childhood talking to relatives long-distance across a continent have the same sense of distance as their ancestors a hundred years ago? We do not know; there is no solid evidence.

12.4 Religious and occult beliefs will have to take account of the telephone. (Type D)

Although religion was not a frequently mentioned topic it did appear on occasion. As discussed previously (section 8.3), the National Conference of Old German Baptists had adopted a resolution ordering all members of the church to discontinue the use of telephones. They argued that the telephone is a device of Satan, that it makes people lazy, and that there is no warrant in Scripture for its use.

On the opposite side the Chicago Christian Endeavor Union announced its plans to save 100,000 souls within one year by calling lists of unconverted friends of members.⁵ The evangelists' contemporary leadership in using satellite/cable networks or the Ayatollah Khomeini of Iran's leadership in using international phone calls from Paris recorded on cassette tape recorders in Teheran to promote his revolution against the Shah is part of a long tradition. Those who are convinced that they know the truths that others should believe, can be quite innovative in accepting new means for achieving their mission.

A 1909 issue of *Telephony* cited a Los Angeles report that the telephone companies in the area had noted a material increase in use of their lines following the use of the telephone for "absent treatment" of patients by Christian Scientist healers.

12.5 The telephone system will create a spirit of service. (Type C)

"Service" was one of the key slogans of the Bell System. The company publicized heroism by operators and linesmen. Such stories appeared frequently in the general press.⁶ Probably, however, that spirit owes more to the perspective that Vail brought to the company, than to anything inherent in the telephone. Coming from the public service, Vail saw the building of a telephone system as not only a business but a mission. It was this resolution to service over immediate profits that caused his retirement from the company from 1887 to 1907.

A different theory of this altruistic spirit is found in an interesting article by Frederic A. C. Perrine, in *Electrical Engineering*, in 1894.⁷ He noted a marked difference between electrical engineers and other engineers in the spirit of social reform. Anyone prominent in electrical invention is likely in some period of his life to have "bent his energies toward some phase of reforming political economy." He notes the prominence in the first electrical congress in Paris of former St. Simonians. He attributes this confluence to the unlimited horizons of electrical science.

12.6 Beyond telephony lies telepathy and psychic powers. (Type B)

A few of the more starry-eyed writers on the telephone saw it as but a stage toward man's ability to communicate by means as yet unknown, perhaps from brain to brain.⁸ In a slightly less specific vein various writers at the turn of the century predicted that within the 20th century a new means of transmitting intelligence would be found superceding all the physical barriers on telephony and telegraphy.⁹ Sometimes these far-flung fantasies were camouflaged in jest; like all jokes they nonetheless conveyed someone's thoughts.¹⁰

FOOTNOTES

¹ Erwin Canham. *Awakening: The World at Mid-Century*. New York: Longman's Green, 1950, p. 8.

² Casson. The Social Value of the Telephone.

³ Initiated in 1879 in Lowell, Mass. during a measles epidemic to reduce dependency on experienced operators, in case they became ill. *AT&T Events in Telephone History*, PE-109, AT&T, Sept. 1974.

⁴ E.g., A Mental Telephone Index. *Atlantic Monthly*, July 1912, 110, 140-42.

⁵ A number of experiments were made in offering church services by telephone. Cf., Church Services By Telephone. *Telephony*, July 1904, 8 (2), 35; Church and Theatre Service By Telephone. *Telephony*, June 1907, 13 (6), 414-15.

⁶ Cf. Enos A. Mills. Linemen Heroes on the Crest of the Continent, p. 14; Allen Tupper True. The Trouble Hunter. *Scribner's Magazine*, Jan. 1911, 49, 92-102; The Linemen's Devotion to His Job. *Literary Digest*, March 14, 1/8 914, 48, 572ff.

⁷ Perrine. *Electrical Engineering and Social Reform*.

⁸ Cf. *Electrical Engineering*, "Comment and Clippings" 1893, 2, 347.

⁹ Cf. Harry S. Coyle. Evolution of Intelligence Transmission. *Telephony*, Oct. 1901, 2 (4), 168; Julian Hawthorne. A Twentieth Century Forecast. *Bookman's Magazine*, Sept. 1903, 2, 307-312.

¹⁰ Adrienne Yanekian. *The Telephone Pioneers of America, 1911-1961*. New York; Telephone Pioneers of America, 1961, p. 76 reports a humorous skit put on by some early telephonists in 1913 portraying communication in 2113, by which time thought transference had replaced other means of communication.

III

Conclusion

Some general conclusions about the field of technology assessment can be drawn from the inventory above, but one warning must be stated. Our conclusions derive from a particular case study of the telephone. The technology we have studied was that of a consumer product that entered into use through the market. The conclusions we draw might not apply to a new military device or to the space program, for example. The mechanisms by which such non-market technologies are adopted and affect society could be quite different.

In the telephone's case a variety of alternative technologies were available to meet human needs for rapid remote communication. The choice among the technological alternatives and decisions about just what services to offer, and in which ways they should function, was generally determined by an economic-technical set of considerations. There were technical parameters as to what was possible, but almost always several alternatives were within the range of physical possibility. What actually emerged was determined by what could be effectively marketed, for what activities capital could be raised, and what arrangements would allow for efficient billing—in short, by economic considerations.

In the list of 186 impacts that we have discussed above 143 fit that model. The 43 others in which economic considerations were not dominant were largely side-effects of the service that came to be offered—such as a decline in emphasis on handwriting in the schools or a gain in sense of security. In a causal model these would be second step results arising from the structure of services that stemmed directly from economic-technical calculations.

For a technology assessment (at least one dealing with this kind of technology) one needs first to bring to bear a technical-economic analysis that

explores the investment and marketing possibilities of each technical alternative. The best forecasts made about the telephone arose from just such analyses by people who both understood the technology and sought to assess how to implement it in a way that would pay. Some of the very best forecasts were made by people like Graham Bell and Theodore Vail, who not only understood the technology well but also had to face up to hard market facts on which their success depended.

Name Index

- Abbott, A. V., 24, 25, 37
Abler, R., 42, 54
Aitkin, I. W., 26, 37
Anderson, M., 3, 16
Antrim, M. T., 124, 127, 130, 131, 132, 133, 134, 135
Aronson, S. H., 21, 22, 23, 24, 25, 29, 30, 36, 37, 38, 59, 68, 81, 91, 97, 98, 101, 107, 109, 123, 126
Ashby, E., 3, 16
Attali, J., 24, 36
Atwood, A. W., 61, 69
Bain, A., 115
Banning, W. P., 148, 149
Barnouw, E., 116, 126
Bassett, W. W., 49, 50, 56
Baxter, S., 129, 132, 134, 135
Bell, A. G., 1, 10, 21, 22, 23, 24, 25, 26, 28, 29, 34, 41, 43, 81, 83, 91, 106, 107, 109, 111, 112, 115, 116, 125, 129, 134
Bellamy, E., 81, 91
Bennett, A., 123, 131, 132, 135
Bergengren, R., 66, 69, 93, 100
Berliner, E., 28, 111
Blood, G. T., 119
Boettinger, H., 61, 68, 86, 92
Bolitho, H., 147, 149
Boorstein, D., 31, 38
Brandeis, L. D., 141
Briggs, A., 23, 26, 81, 91, 130, 134
Brooks, J., 35, 39, 129, 134
Brooks, S., 77, 91, 129, 134, 147, 149
Brousseau, R., 21, 36, 49, 50, 54, 56, 57
Brown, A. T., 43, 54, 55
Bruce, R. V., 24, 25, 36, 37, 106, 109, 115, 124, 125, 127, 103, 134
Buchanan, 89
Burlingame, R., 27, 37, 44, 55
Butler, P., 141
Campbell, G. A., 28, 112
Campbell, W. L., 46, 55
Canhan, E., 151, 153
Carter, J., 73
Carty, J. J., 9, 14, 16, 29, 32, 34, 38, 43, 89, 112, 145, 146
Caselli, G., 115
Casson, H., 21, 27, 28, 36, 37, 42, 53, 54, 57, 60, 61, 62, 63, 64, 65, 72, 74, 83, 90, 92, 93, 98, 99, 101, 105, 109, 116, 126, 141, 144, 146, 149, 151, 153
Cherry, C., 23, 24, 36, 61, 68, 86, 92, 108, 109, 126, 130, 134
Childs, F. H., 72, 90
Clay, B., 76, 91
Clement, E. E., 29, 33, 34, 38
Cleveland, G., 72
Coase, R., 60
Coates, V. T., 4, 16
Colton, A. F., 82, 92
Coolidge, C., 84
Cottrell, W. F., 108, 110
Cowan, P., 41, 54
Coyle, H. S., 153, 153
Crawford, A., 124, 126
Danielson, N. R., 35, 39
DaVinci, L., 3
Davison, K. E., 72, 90
De Forest, L., 34, 87, 114
de Laud, F., 25, 37
Dilts, M. M., 23, 24, 26, 27, 36, 37, 86, 87, 89, 92, 93, 94, 95, 97, 100, 101, 103, 104, 114, 116, 120, 121, 122, 124, 125, 126, 129, 134, 140, 143
Dizard, S., 28, 35, 37, 39, 113, 119, 125
Doolittle, T. B., 119

- Dresser, G., 80
 Early, S. P., 73
 Edison, T. A., 31, 107, 111, 112, 113, 114
 Fagen, M. D., 10, 17
 Fawcett, W., 72, 73, 90, 113, 116, 126
 Ferrell, R. H., 88, 92
 Field, K., 116
 Finn, B., 4, 16
 Flemming, J. A., 139, 143
 Flynt, J., 96, 97, 100
 Forbes, W. H., 62, 69
 Fowler, J. B., 116
 Free, E. E., 98, 101
 Frey, F., 7, 16
 Garfield, J. A., 72
 Gibbons, M., 6
 Gifford, W., 117
 Gilfillan, S. C., 116, 117, 126, 146, 149
 Glaab, C. N., 43, 54, 55
 Gottmann, J., 42, 44, 45, 54, 55
 Gradenwitz, A., 95, 100
 Gray, E., 106, 107, 109, 111
 Griswold, A. H., 35, 39, 84
 Haggard, R., 51, 56
 Hall, E. J., 71, 72, 148
 Harding, W., 84
 Harriman, E. H., 59, 63
 Harrison, W. H., 72
 Hastie, A. H., 86, 92
 Hawthorne, J., 153
 Hayes, H., 28, 112, 119
 Hayes, R. B., 72
 Hendrick, B. J., 21, 36, 49, 50, 52, 56, 63, 66, 69, 103, 104, 106, 109, 137, 143
 Henry, P. C., 101
 Heyer, G. K., 108, 110
 Hibbard, A. S., 119, 124, 126, 127
 Hill, R. B., 27, 29, 37, 38
 Hitler, A., 86
 Holland, J. D., 121, 126
 Hoover, H., 88, 92, 129, 134
 Howard, E., 46, 55
 Hubbard, E., 106, 109
 Hubbard, G. G., 24, 25, 37, 106, 107, 124, 140
 Hubbard, H. V., 46, 47, 55, 80, 91
 Hubbard, J., 130, 134
 Hubbard, T. K., 46, 47, 55, 80, 91
 Ives, H., 118, 126
 James, W. H., 79, 91
 Jewett, F. B., 117
 Jones, W. C., 29, 30, 38, 111, 125
 Keller, S., 130, 134
 Kellog, H. H., 75, 90
 Kelvin, Lord, See Sir William Thomson
 Kennedy, J. F., 73
 Kingsbury, J. E., 24, 36, 109, 118
 Korn, A., 115
 Kuykendall, 75
 Lang, A., 125, 127, 139, 140, 143
 Latzke, P., 77, 91
 Leech, M., 78, 91
 Leonard, V. A., 95, 96, 100
 Lester, D., 99, 101
 Lewis, D. J., 67, 69
 Maddox, B., 132, 135
 Marconi, G., 29, 37, 38, 114
 Marland, E. A., 30, 38
 Marquis, D. G., 14, 17
 Maxfield, J. P., 114, 125
 Mayer, M., 9, 17, 125, 127, 129, 131, 133, 134, 135
 McDonough, W. H., 21, 36
 McKinley, W., 72, 78
 McLuhan, M., 60, 61, 68, 97, 101
 McMeer, S. G., 125, 127
 Mills, E. A., 63, 69, 152, 153
 Molina, E. C., 119
 Moorhead, F. G., 140, 143
 Morgan, H. W., 78, 91
 Morgan, J. P., 50, 62, 63, 69
 Moyer, J. A., 42, 44, 54, 55
 Mumford, J. K., 43, 54, 68, 69, 132, 135, 145, 146, 148, 149
 Myers, S., 14, 17
 Nolen, J., 46, 55
 Noss, T. K., 48, 56
 Ogburn, W. F., 21, 36, 89, 92, 139, 143
 Page, A., 44, 55, 60, 68, 97, 100, 130, 134
 Peel, C. S., 138, 143
 Perkins, G. W., 59, 63
 Perrine, F. A. C., 3, 16, 44, 55, 152, 153
 Perry, C. R., 24, 36, 86, 92
 Pollock, J. K., 105, 109
 Ponton, J., 25
 Pool, I., 5, 9, 10, 16, 17, 27, 37, 49, 56, 65, 69, 81, 91
 Pound, A., 47, 55, 71, 86, 87, 90, 92, 98, 101
 Preece, Sir, W., 65, 69
 Punch, 23, 107
 Ralston, D., 24, 36
 Redlich, F., 60, 68

- Reid, A. A. L., 130, 134
Rice, S. A., 54, 57, 142, 144
Richardson, A. S., 125, 127, 133, 135,
137, 138, 139, 142, 143, 144
Robinson, C. M., 46, 55, 131, 134
Robinson, P. G., 79, 91, 93, 99, 131, 134
Rockel, W. H., 77, 91
Roosevelt, F. D., 73, 84
Rorty, M. C., 119
Rotherie, E. M., 116, 126
Sanders, T., 24, 111
Sawyer, W., 115
Schegloff, E. A., 138, 143
Sears, V. A., 94, 100
Smith, A. B., 46, 55
Speer, A., 90, 92
Spofford, H., 131, 134
Squire, G. O., 115, 125
Stalin, J., 86
Stanton, L. W., 140, 143
Stehman, J. W., 61, 69
Stern, P. K., 116
Stourdze, Y., 24, 36
Strowger, A. B., 26, 37
Sussman, L., 73, 90
Taft, W. H., 140
Tarr, J., 16
Thomson, Sir, W., 27, 37, 124
Thorngren, B., 6, 130, 134
Thornton, W. W., 75, 90
True, A. T., 152, 153
Trumbo, D., 140, 143
Turner, C., 93, 99, 129, 134
Twain, M., 124, 127, 129, 131, 134, 137,
143
Vail, T., 10, 22, 24, 25, 27, 28, 29, 34,
37, 53, 54, 57, 77, 91, 111, 112,
119, 152, 156
Van Devanter, H. R., 99, 101
Vanzile, L., 95, 100
Vizetelly, F. M., 148
Waldron, F., 141, 143
Wallace, E., 95, 100
Warner, Jr., S. B., 44, 55
Waterson, K. W., 119
Watson, T., 29, 81
Wells, H. G., 14, 17, 44, 45, 55, 66, 69,
105, 109, 142, 144
Westrum, R. M., 60, 68, 90, 92
Weymouth, L., 108, 110
Whipple, W. G., 75, 90
Willey, M. M., 54, 55, 142, 144
Williams, H. S., 21, 36, 61, 69
Wilson, W., 73, 79
Withington, A., 132, 135
Wooley, E. M., 103, 104
Wright, O., 3
Wurtzel, A. H., 93, 99, 129, 134
Yanekian, A., 153, 153

Subject Index

- Adolescents, See Youth
Alarms, 122
American Academy of Arts and Sciences, 115
Answering services, 11, 122
AT&T, 9–10, 11, 22, 26, 27, 34, 35, 37, 39,
51–52, 53, 59, 61–62, 64, 80, 84, 86, 104,
106, 109, 110, 112–114, 117, 118–119,
121–122, 132, 145
Automatic switching, 25–26, 65, 121, 122
Belgium, 88
Bell Telephone Laboratories, 111–113, 114,
117, 119
Boxer Rebellion, 90
Broadcasting, 27, 35, 50, 79, 81–82, 83–86, 111,
115, 118, 146
Budapest, 81, 121
Business, 13, 41–42, 47, 59–69, 105, 108, 123
Cables, coaxial, see Coaxial cables
Cables, undersea, 34, 87, 89
Canvassing, 67, 68, 78–81, 123
Centralization-decentralization, 11, 59–69, 71–
74, 87–88, 89–90
Chase Bank, 114
China, 48, 87, 90, 121
Cities, See Urban ecology
City planning, See Planning
Coaxial cable, 15, 118, 139
Competition, See Monopoly
Conference calls, 120–121
Copper, 28, 103–104
Courtesy, 137–138
Courts, See Law
Crime, 16, 47, 49, 94–97, 98, 122
Cross-impact analysis, 3
Decentralization, See Centralization
Delphi technique, 3
Democratization, 61, 86
Dialects, 71–72, 148
Dialing, See Automatic switching
Diplomacy, 60, 73, 86–89
Directories, 47, 80, 120, 129
Drama, 13, 147
Elderly, 131
Election campaigns, 78–81, 91
Electric engineering, 145, 152
Electric power, 3, 51, 53, 54
Elevators, 42–43
Emergency services, 50, 93–101, 122
England, See Great Britain
Environment, 103–104
ERPI, 114
Etiquette, See Courtesy
Facilitator, telephone as, 42–43
Facsimile, 30, 115
Family, 130, 151
Farm, See Rural Life and System
Fiction, 147
Finance, 61–64
Fire Fighting, 16, 46, 49, 93–94, 98, 122
Forests, 103
France, 6, 24, 26, 36, 37, 86, 87, 88, 94, 113,
115, 121–122, 152
Germany, 53, 86, 87, 88, 95, 113, 115
Government and politics, 13, 71–91, 95
Great Britain, 6, 36, 37, 74–75, 83, 86, 87, 88,
94, 115
Handwriting, See Writing
Harvard University, 28, 112
Herzian waves, 34, 37–38
History, 147
Hot lines, 99
Italy, 87, 113
Japan, 87
Journalists, See Newspapers
Kingsbury Commitment, 109, 118
Labor, 64–66, 80, 105, 108–110, 132, 145
Law, 22, 74–77
Letter writing, 12, 32, 106, 138, 147

- Literary Digest, 80, 99, 124
 Literature, 13, 147
 Loneliness, 129, 131
 Long distance service, 26-29, 31-32, 59-60,
 63-64, 67, 71-72, 78-79, 83-84, 86-88
 Mail, See Postal service
 Marketing, 66-68
 Mass Media, 79, 81-85, 146
 Massachusetts Institute of Technology, 10, 28,
 112, 146
 Medicine, 12, 42, 49, 97-99, 124
 Megalopolis, 44-45
 Messengers, 23, 64-65
 Metered service, 22
 Microwaves, 139
 Monopoly, 25, 77-78
 Motion pictures, 114
 Nationalization, 24, 36
 Neighborhoods, 42, 45-46, 120
 Networking, 83-84, 115
 Newspapers, 11, 63, 83
 Obscenity, 15, 76-77, 97, 133-134, 137
 Operators, 25-26, 51, 53, 65, 98, 120-122, 129,
 140, 148, 152
 Paper making, 120
 Party lines, 5-6, 49-50, 140
 Pay phones, 22, 123-124
 Peace, 89
 Penetration rates, 6, 35n, 52-53, 106
 Phone books, See Directories
 Phonograph, 31-33, 111, 113-114
 Picture phone, 45, 115-118
 Planning, city and regional, 46-47, 120
 Police, See Crime
 Politics, See Government
 Polling, See Canvassing
 Post Roads Act of 1866, 75
 Postal service, 11, 24, 48, 64, 106-107
 Press, See Newspapers
 Printing, 120
 Privacy, 5-6, 25, 86, 97, 124-125, 139-143
 Profanity, 76-77, 137
 Public utilities, 21, 24-25
 Punch Magazine, 23, 30, 107, 116
 Pupin coil, 28, 87, 103, 112
 Quality control, 119
 Radio telephony, 31, 33-35, 46, 113-115
 RCA, 82-85, 114
 Recorders, 33, 121-122
 Regulation, 77-78
 Religion, 13, 99, 125, 152
 Research and Development, 35, 85, 11-127
 Royal Institution, London, 146
 Rural Life and systems, 11, 23, 26, 48-54, 63,
 66, 94, 122, 129, 140
 Russo-Japanese War, 90
 Sampling, 119
 Science, 145-146
 Sex, 133
 Shopping, See Marketing
 Skyscrapers, 11, 43
 Smoke abatement, 3
 Soviet Union, 6-7, 48, 86
 Statistics, 119
 St. Simonians, 152
 Suburbs, 7-8, 11, 43-44, 93, 131
 Sweden, 6, 121-122
 Switching, 8, 24-26, 30, 65, 121, 122
 Taxi calling, 11, 123
 Technology Assessment, 1-4, 10, 13-15,
 155-156
 Teleconferencing, 120-121
 Telegraph, 7, 11, 23-25, 30, 31, 41, 63, 74-75,
 76, 95-97, 106-109, 110, 111, 115,
 118-119, 146
 Telegraphers, 63, 108, 110
 Telepathy, 13, 153
 Telephotos, 115
 Teletype, 21, 23, 28-29, 30, 109, 118-119
 Television, 15, 51, 72, 82, 115-118, 146
 Transportation, 47-48, 63-64, 105-106
 Travel, 67, 105-106, 123
 United Kingdom, See Great Britain
 Universal service, 22, 24-25
 Urban ecology, 41-48, 51, 120-121
 USSR, See Soviet Union
 Vacuum tube, 28, 82, 87
 Videophone, See Picture phone
 Visiting, 5-6, 11-12, 137, 138, 142
 Walker Report, 10, 118
 Warfare, 89-90
 Washington Conference, 1922, 87
 WEAf, 84
 Weather reports, 50, 93-94, 121-122
 Western Electric, 112, 114
 Western Union, 84, 106-107, 109, 111, 118
 Wireless, 33-35, 87, 113-115, 139, 146
 Women, 7-8, 11-12, 25-26, 49, 64, 93,
 129-133, 137-138, 148
 Writing, 5, 12, 32, 74, 106, 138-139, 142, 147
 Youth, 13, 132-133
 Zoning, 46-47