III

The Telephone and The City

Editor's Comment

Of all the telephone's effects, none is more dramatic than its impact on the ecology of the city and countryside. For thirty years beginning in the mid 1890s, every few months someone wrote about how the telephone was rescuing farmers from rural loneliness. They could learn when the price was right for bringing crops to town, call the doctor when a child was sick, or call for help when there was a fire. Life on the farm, the writers said, would become tolerable. In 1905 someone wrote "with a telephone in the house, a buggy in the barn, and a rural mail box at the gate, the problem of how to keep the boys and girls on the farm is solved."

At the time that he wrote, 34 percent of the American work force were farmers. Little did he realize that seventy years later only 4 percent of the work force would remain on farms. Nonetheless, the phone did appeal to farmers. Primitive systems were widely established, sometimes using barbed wire fences as signal carriers. At one time early in the century, the rural state of Iowa had the country's highest telephone penetration rate. Yet, the phone did not reverse (even though it slowed) the massive migration from the country to the cities.

The telephone's direct effects on urban life are equally important, and equally ambiguous. In the introduction we noted the central question: has the telephone fostered dispersion and the growth of suburbia, or has it fostered overcrowding in the core city? The common sense answer might be the former. If the telephone has made it possible to form communities without contiguity, move to the suburbs without losing touch with those left behind, and operate businesses from outlying low-rent loca-

tions, then how can one doubt the phone's key role in urban sprawl?

Yet all the authors in this book who consider the question (Jean Gottmann, Ronald Abler, Alan Moyer, Ithiel Pool, and Bertil Thorngren) conclude that the phone's relationship to the city is far more complex and not what it seems. As noted in Chapter 6, the telephone contributed as much to the practicality of tall buildings and to core city density as to dispersion.

Jean Gottmann, the Oxford geographer to whom we owe the concept of megalopolis, clarifies the complexity of the processes that are changing the structure of modern cities. Megalopolis is not the decomposition of the city into an undifferentiated urban sprawl. Gottmann describes that pattern of human ecology as "antipolis" and argues that what is emerging (partly with the telephone's help) is a complex and genuinely urban megalopolis—not antipolis.

Both Gottmann and Abler examine the changing structure of the work force—specifically the growth of quaternary occupations—and its effect on patterns of settlement and the dependence of those occupations on adequate means of communication. They also examine the changing spatial and organizational relationships among business offices, manufacturing plants, and marketplaces. These processes of ecological change have shaped the modern city.

Abler traces these processes in U.S. data on the occupational distribution of the population, the phone system's geographic spread, the declining communication distance between places, and the location of activities within urban complexes.

J. Alan Moyer covers some of the same ground in an intensive case study of the history of Boston. Its spread began before the telephone, largely along streetcar lines. The advent of the phone greatly helped processes that had already begun, making suburban living and business activity more feasible. The precise form of the telephone billing system made a large difference in which businesses would function well and where. It was not only the telephone but the system's organization that influenced patterns of urban growth.

In the following section, Bertil Thorngren discusses some of these issues as he examines who communicates to whom on the

phone (we shall return to that topic later). He also supports the notion that the phone is not antipolitan; it facilitated urban growth.

"Facilitate" is perhaps the key word. The phone could make life better on the farm or make it easier to move to the city. It made possible suburban operation of urban businesses; it also made possible downtown operation of businesses away from plants and customers. It is rare that one can identify a unique effect of the telephone as such.

In this respect the telephone is not like a new railroad, a new oil field, or the invention of the cotton gin; each of those has a specific use for a specific industry in a specific location. As such, its social impact can be described more definitely; each pushed society in a certain direction. The telephone is quite different. It is a facilitating device with a myriad of uses for a myriad of people and has thus magnified whatever processes were taking place in society at a given time. Since societies are neither unified nor consistent, the telephone often contributed simultaneously to quite opposite developments.

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Megalopolis and Antipolis: The Telephone and the Structure of the City

Jean Gottmann

The telephone has for some time been at the heart of a debate about the design of the modern city. The basic question under discussion is whether in the present evolution toward an information society, the gathering of people in cities is still necessary. As telecommunications improve, could the massive and dense concentration in large urban centers, and the nuisances this concentration entails, be done away with and replaced by a scattered habitat held together by networks of wires and waves? The telephone experience seems to be crucial in the matter because of all such networks it is the most ancient and the most widespread; moreover, of all the means of person-to-person communication it provides the greatest feeling of closeness and intellectual intimacy. This is a momentous debate because it examines the play of forces affecting the geographical pattern of settlement and because it probes deep into the stucture of urban society.

The role of the telephone in the evolution of the urban way of life has been considerable and may still be increasing. Nevertheless, a search of the libraries reveals amazingly little scholarly analysis of these issues. Mostly one finds brief statements interspersed in the literature concerned with the impact of communications on location or on the traditional role of distance or on spatial differentiation. Many of these statements are projections into the future, based on fragile assumptions of what the writers believe people want.

Some opinions hold that the improvement of personal communications brought about by generalized telephone use fosters the growth of selected transactional centers and the sprawl of

vast urban systems. If these opinions are right, the progress of the telephone has helped and perhaps caused megalopolitan formations. A more commonly encountered view is that the telephone encourages geographical scatteration of the places where telephone users live and work and that this trend will develop until it brings about a complete dispersal of settlement and the dissolution of compact cities. If the former opinion may be called promegalopolitan, the latter could be termed "antipolitan." This antipolitan view begins to deny the need for traditional urban agglomeration, for the old *polis* of the Greeks.

These two views seem to be in clear conflict. Which one is correct? On the one hand, in North America (understood as the United States and Canada), by far the best telephone-equipped section of the world, urban sprawl and metropolitanization have progressed faster and more widely than anywhere else. On the other hand, on this continent some 44 percent of the population live in big cities—that is, in urban agglomerations of 500,000 inhabitants or more. This percentage, calculated for 1975 by the United Nations Statistical Office, has risen since 1960 when it was 36 percent. Most of that big-city growth developed together with the excellent facilities of the telephone and other telecommunication networks. In other parts of the world, urban concentration can generally be shown to be proportional to the intensity of telephone use.

Let us attempt a cold-blooded look at the role of the telephone in the present evolution of the physical and social structure of the city. This is an involved matter in which many forces besides telecommunications are at work. It may well be that the role of the telephone is considerable, but the case is not so simple or one-sided as it has too often been assumed since the days of Alexander Graham Bell.

THE TELEPHONE AND THE FUNGIBILITY OF SPACE

Direct verbal communication between persons is an essential element in the foundation of human society; it is at the basis of the family system and of the negotiation of transactions. Until the nineteenth century, all communications were greatly impeded by distance. In the second half of that century, distance began to be conquered by the spread of diverse new technologies

and organizational advances. As the technology of steamers and trains improved, the Suez Canal was opened in 1869 and the first transcontinental railway completed in the United States. The improvement of continuous transportation networks around the globe, sewing together the mushrooming centers of population, created the need for more transactions and for more and better communications. The birth of the telephone in 1876 is historically sandwiched between the establishment of the Universal Postal Union in 1875 and the invention of the Gramophone by Edison in 1877. In three successive years, the means of communicating between people scattered around the globe and of recording communications were revolutionized by new prospects of three different kinds. The telephone, which made possible a quasi-instant connection between people located at a distance from one another, seemed destined to modify the relationships built into society by distance and the partitioning of geographical space.

Alexander Graham Bell and many other Americans saw deep social and political changes resulting from the spread of telephone service. On the occasion of the telephone's fiftieth anniversary in 1926, Arthur Pound expressed this faith strongly in a book entitled *The Telephone Idea: Fifty Years Later*. Pound was right in stressing that "words are most precious freight" and that the telephone was "getting the message through" faster and better than could have been done previously, but he went much further in assessing the impact of the telephone on widely scattered populations. He saw it as a "cohesive force for the Nation," as an "antidote for sectionalism," and as an "invigorator for trade." The first and third qualifications have certainly been supported by the experience of the last century. The second statement about sectionalism is rather debatable.

These apparently were Bell's beliefs from the start. He is credited with saying in 1876 that "some day all the people of the United States will sing the Star Spangled Banner in unison by means of the telephone." When inaugurating the Long Lines transcontinental connection in 1915, Bell spoke from New York with T. A. Watson in San Francisco. Pound reports it was said that "had the telephone system reached its present perfection previous to 1861, the Civil War would not have occurred. The wires would not have let the North and South drift so far

apart." This was said in January 1915. Later that same year telephone lines began to be used in the trenches dug on both sides of the front dividing Europe in World War I. Sixty years later in 1975, I received a circular in my Oxford office to be kept near my telephone, instructing me what to do in case a call came saying that a bomb had been planted in the building.

Like so many other Promethean dreamers, Bell and his associates had an exaggerated confidence in man's motives, in the workings of society, and in the ease with which the differences recorded on political maps could be overcome. Mankind has always had need of prophets announcing a Golden Age, but to expect the telephone to bring this about was and remains an overestimation of the power of technology; and, what is especially significant for my purpose here, of the impact of distance.

Indeed, excellent modern telephone systems get the message through, but what does the message carry? And to what extent can it modify intentions at both ends of the line? Overcoming distance does not necessarily bring closer together the points of view and patterns of interest established at the places separated by distance. The arrival of the message may exacerbate or precipitate the conflict, rather than pacify it, if conflict there is. However, pursuing this sort of exercise in logic would not be fair to what the prophets of the telephone wanted to convey in their romantic pronouncements. The telephone enabled the voices of individuals to penetrate space or other physical obstacles to its propagation and to request an immediate response. It did not cancel out distance or organization of space but modified the use or effect of both.

The development of technology has never been aimed solely at saving human labor and reducing physical exertion. It has also been aimed at making geographical space, the space inhabited by mankind, *fungible*. If this condition were achieved, an infinity of problems that have always plagued individuals and society would be resolved. The fungibility of space would mean that every point in that space would for all practical purposes be equivalent to any other point. Geometrical space is fungible unless otherwise qualified. Geographical space is not, both because of physically diversified conditions and because of the differentiation and partitioning added by man-made economic, social, and political organization. But in the aspiration of men

and women, some day, when paradise would extend on earth, every place in it would enjoy all the virtues and advantages that a place in the sun can provide. No one would then have reason to covet anyone else's location. Peace would reign, assuming, of course, that inequality in the distribution of material goods and benefits is the only source of conflict.

Exploration and technology were largely conceived as tools for bringing closer such a unity and uniformity of space. The objective of a large sector of science has always been to elucidate the general laws of human behavior and to standardize that behavior. This latter stage, it has been thought, would be easier to achieve if geographical space, with all its resources, could be made fungible. It is debatable whether modern improved means of transport have actually advanced the fungibility of space. There can be no doubt, however, that modern telephone systems, with their use of wires and waves, switchboards and computers, cables and satellites, have made the space they serve more fungible for communication purposes. It has become possible, in principle, for individuals located anywhere in that space to converse with one another.

To the extent that the pattern of settlement is determined by man's need to communicate with others and to obtain information quickly, it must be affected by the telephone.

THE PATTERN OF SETTLEMENT AND THE USE OF THE TELEPHONE

The telephone has immensely improved the faculty of isolated people to communicate with others outside their household. By 1926, as noted by Arthur Pound in his book on the first fifty years, the telephone was already "a fundamental fact of American farm life; . . . the farmer's first aid." Indeed, to people settled in a scattered pattern, in relatively isolated buildings, the telephone gave a heightened sense of security against hazards and provided an escape from loneliness. What was true of those dispersed on farms was also true of categories of individuals isolated by physical or social circumstances restricting their movements outside their home. There are several such categories: invalids, the elderly, young children, residents of places where streets or roads are reputed to be unsafe. The last situa-

tion arises, alas, with increasing frequency in a variety of dense settlements. The rapid increase in the use of telephone lines that led to the crisis in the New York City network in 1969–1970 has partially been explained by the fear of the rising criminality in that city. It caused many inhabitants to stay at home and call instead of visiting friends and relatives.

Such help to the lonely must be recognized as a great social virtue of the telephone. It relieves scattered settlements which experience certain drawbacks due to relative isolation. This could not, however, be enough to foster scatteration. One must recognize that the use of the telephone also relieves some aspects of isolation which in recent times have been characteristic of certain large, dense urban centers. In fact, the telephone can be described as being first aid as much for individuals located in high-rise towers and in massive central concentrations of people as it is for those on isolated farms. The number, frequency, and urgency of contacts to exchange news or opinions is usually greater in the business conducted in central districts than in farming routine. Moreover, as there is usually some cost involved in every call and the cost is smaller within a dense community, one may expect much heavier use of the lines per telephone installed, and even per capita, within large agglomerations than in the rural countryside and between distant locations in general. Statistical counts usually support the hypothesis that the intensity of telephone traffic decreases with distance and with the dispersal of settlement.

There are, however, significant anomalies in this general pattern. The anomalies affect the structure of the rate system, but they also provide interesting clues to relationships between patterns of settlement and the telephone. The flow of telephone calls reaches higher intensity, for instance, between cities concentrating white-collar workers and transactional activities than between cities of similar or even larger size but concerned mainly with blue-collar work. In the megalopolis on the northeastern seaboard, this relationship between concentration of offices and higher intensity of telephone use was clearly documented in my book (*Megalopolis*, 1961, pp. 582–597). The flow of calls was particularly great between cities having a common specialization, for instance, Hartford, Connecticut, and Newark,

New Jersey, because both have headquarters of large insurance companies.

Certain categories of work use the telephone more than others in the pursuit of their routine. Communications or information-oriented work seems to need the telephone most, and this can easily be illustrated by the density of telephones and of the flow of calls in centers of administration, business, and research. The main growth sector of the labor force in the last thirty years has been in white-collar occupations, particularly in the occupations called quaternary which process, analyze, and distribute information. The telephone's role in the actual operation of these categories of work, largely conducted in offices and laboratories, has been considerable. To what extent has it determined the location and the geographical distribution of offices and laboratories?

Most students of office location recognize the telephone as the main factor which allowed geographical separation between office work and the other stages of business it administered, such as production, warehousing, and shipping of goods (Daniels, 1975). The office could be moved from the premises adjoining the plant to a section of town or even to another town where it could find an especially favorable hosting environment. As office work underwent rapid fractioning due to specialization and division of labor, its various parts could easily be located in clearly separate spaces owing to the excellent communication provided by the telephone network. As the material processed by many offices was being increasingly stored in the memories of electronic robots, communication with these stores was provided by the telephone network. The stored material was thus equally available at every place equipped with a terminal connected with the central computing equipment.

The telephone appears to have made office work footloose, liberating it from old locational shackles. The result has been the concentration of offices in selected districts of cities and towns and also huge congregations in certain selected cities. This trend produced the specific architectural form of the skyscraper and the skyline. It should be recognized that lofty, dense skylines exist as much owing to the telephone as to the elevator. Such a dense and massive piling up of office and ser-

vicing activities could not function without the widespread, diversified, and incessant flow of communications within the conglomeration and outside it that is obtained through the excellence of the telephone network.

The telephone's impact on office location has thus been dual: first, it has freed the office from the previous necessity of locating next to the operations it directed; second, it has helped to gather offices in large concentrations in special areas. The concentration of office work and of the related but diverse services catering to the needs and fancies of office workers has been, particularly in countries of advanced economy, a major factor of urban growth and urban redevelopment. The modern city is increasingly becoming a white-collar, transactional center as manufacturing, production, and warehousing move out to suburban or small town locations. Office concentration is recognized as one of the reasons for centralization and congestion, with their attendant high costs, nuisances, resentments, and other problems. Therefore, office decentralization has come to be considered a desirable policy, especially in areas of huge agglomeration, such as megalopolis in the United States, or the London, Paris, and Amsterdam metropolitan regions in Western Europe, Tokyo in Japan, etc.

One of the main arguments constantly put forward around the world for office dispersal is the excellence of present telecommunications, and the anticipated technological improvements. It is said that in an information-based society, large cities essentially founded on their transactional and communication functions will gradually dissolve. The telephone network supplemented by television, telex, cassettes, computers, and other means of distributing audiovisual materials would eliminate the need for physical presence at meetings, conferences, and other collective events. As a study of offices in England suggests: "Office work may become a cottage industry" (Cowan, 1969). If offices follow the outward trend of manufactures, little would remain of the centrality of large modern cities; all recent trends of urbanization would then be reversed, and a dispersed pattern of settlement would prevail.

The telephone can thus be presented as a factor of concentration in the location of quaternary work as well, apparently, as a factor of its dispersal; so great is its impact that it may be oper-

ating both ways at the same time. If we admit that such a conflicting duality of influence is correct, the conclusion may be that the patterns of settlement are determined by other factors which direct people to use the telephone in one way or another, depending on the way of life and city structure they choose.

To base a forecast of the dissolution of the "white-collar cities" on the impact of improved telecommunications requires acceptance of several assumptions: first, that access to the material transmitted by these means of information will fully satisfy most people for their work and leisure; second, that isolated living with good communications will satisfy most people; third, that the quality of personnel and the availability of adequate labor resources could be maintained by remote control; fourth, that the vast expenditure of energy and materials necessary to operate and maintain the networks of supply and the movements of a dispersed population would not be too costly; and last but not least, that most individuals have no reason for frequent recurrent presence in urban centers other than efficiency of work.

None of these assumptions appears realistic. Rather the experience of the last 100 years indicates that the telephone has been used in the evolution of settlement in diverse ways but mainly as a help in the development of larger metropolitan systems with a more diversified and complex structure. Excellence of communications has made possible the more variegated, multiple, partitioned structure of modern cities. The telephone has not made space fungible; it has not modified human nature much; however, it has permitted a spatial and political restructuring of cities of considerable portent.

THE TELEPHONE AND THE EVOLUTION OF COMMUNITIES

The rapid and enormous growth of metropolitan systems has consumed large tracts of space. An agglomeration that grows from 200,000 inhabitants to a million or from one to five million must devour space. This consumption of acreage will depend on many considerations, including cost of land, provision of services, taste for certain forms and densities of residence, predominant economic activities, and ease of transport and communications. Within the framework of the last factor listed, the

generalization of the individual motorcar and of the telephone have actively aided suburban sprawl.

Growth at the rate and scale of the modern metropolis implies the coexistence within the system of a variety of people and economic activities. As has generally been the rule in cities for some 4,000 years, this variety causes a division into compartments specialized in housing certain groups or activities. In the dynamic circumstances of recent times, especially in countries of advanced economy, the telephone has increased this spatial division of labor and society: the home could be more distant from the place of work, the office of a firm from its plant, the consumer from his supplier. The telephone provides, when needed, quasi-immediate verbal communication between all these interdependent units at minimal cost. However, it is only one of many indispensable networks of electricity, water supply, sewerage, road traffic, retail trade, schools, hospitals, and so forth. Nevertheless, it would have been very difficult for these complex and integrated networks to work in unison without the telephone, which made possible the constant and efficient coordination of all the systems of the large modern city.

It has also greatly improved the rhythm at which city life develops. Here again, the telephone alone cannot create the city, its rhythm, its excitement. Large cities have functioned long before the telephone: Babylon, Jerusalem, Rome, Constantinople, Canton, Paris, London, and even New York and Boston. The telephone has helped make the city better, bigger, more efficient, more exciting. It alleviates loneliness, it helps arrange encounters. It saves its users time, trips, and frustration. A young couple living in Zagreb, Yugoslavia, who are waiting for a home telephone to be installed, told me that a telephone line is more desired and more difficult to obtain in Yugoslav cities than a car. Asked what use they would make of it once it was installed, they said mainly to make appointments. The major urban message the telephone carries is still the same as the first call of Bell to Watson: "I want to see you."

However, the theory that dispersal of settlement is forthcoming because of telecommunications networks is founded on the belief that this type of distant connection will be able to replace face-to-face meetings to the general satisfaction. It is said that just as the elderly replace visits by telephone chats and just as

office workers discuss matters and exchange information by telephone, more and more will do likewise. They will obtain materials by telephone or in the form of recordings; they will hold conferences first by telephone (as many executives do in government or large corporations) and later on closed-circuit television. Hence the office will become "a cottage industry."

In fact, the office has always been to some extent a cottage industry. Authors, editors, and a variety of professionals have preferred doing at least part of their work at home or even in their country houses; some prefer to work on premises where they cannot be reached by telephone, in order not to be disturbed. Such cases are more frequent in Europe than in America, for the use of the telephone and the need for privacy are cultural attitudes, differing from one country to another. Even in America, however, individuals are learning to protect themselves against intrusion by telephone, and communications are being delayed as the caller waits to be called back.

In countries as different as Sweden and Ireland, two experts on office work (Dr. Thorngren and Dr. Bannon) agree that "the use of the telephone by all types of office groups would seem to be confined to contacts . . . which are characteristically fast, frequent, well-structured and, while being important, tend to be related to coordination and routine functions" (Bannon, 1973).

Transacting quaternary business by wire does not at present appear to give results as satisfactory as does physical presence. As Reid documents in Chapter 18, communicating over an electronic network may satisfy individuals who know one another intimately and trust one another fully. Between individuals who do not have a close relationship, communication over networks usually leads to more personal contacts. This need of physical presence, a major factor of urban centrality, seems to be imbedded in human psychology and in the highly competitive character of a dynamic society (Gottmann, 1970).

As a larger sector of employment goes into transactional work, it becomes important to assess the environment hosting such activities. Transactional performance is more difficult to evaluate than productivity in the case of goods or simpler tertiary services. The higher level of transactions are performed in an environment providing amenities and entertainment. Transactional work that involves responsibility in research, analysis, decision-

making, or education is done by relatively well-paid and discriminating personnel. A center of quaternary transactions is normally a large consumer of entertainment, and in competitive situations this may be an important part of the transaction. It is no simple coincidence that Broadway is in Manhattan and that the performing arts flourish in certain centers of wealth and power.

It is to be expected that routine transactions will be increasingly mechanized and automated owing to telecommunication networks. This trend will hardly cause a quantitative decrease in the demand for face-to-face contacts, but these may come to be reserved for an elite or for specially chosen occasions. As the numbers of transactional operations and personnel increase, the demand for communications of all sorts snowballs. Barriers and partitions must be built between the callers and the person or place called. A movement in that direction has started: the gadgetry and personnel related to the telephone are partly aimed at filtering communications demand.

THE TELEPHONE AND THE TRANSHUMANT SOCIETY

Our examination of the telephone's influence on patterns of settlement and location of activities does not lead us to indulge in the hypothesis of a final scatteration of settlement and dissolution of nucleated cities. The telephone, rather, helped to bring people together; it has also helped to maintain or establish linkages despite geographical dispersal when the latter was caused by other influences shaping the way of life. In one way the telephone must be considered as fostering "megalopolitan" formations rather than "antipolitan" scatteration. There is, however, another modern trend in developed Western countries which could be termed "antipolitan" in a sense and which could hardly have developed so much without good telephone service.

This is the trend of a large and increasing proportion of North Americans and Western Europeans to move frequently between two or more places of abode. I do not allude here to the crowds who commute to work, but to individuals who have more than one residence and perhaps more than one place where they perform work useful to their occupation.

These situations proliferate around us. It is becoming increas-

ingly difficult for competitive quaternary personnel to get all their work done in one spot if they can obtain additional information, advice, or relaxation outside the normal location of employment. Very few will feel secure enough not to avail themselves of such additional opportunity. There are also benefits for individuals in our society to have and perhaps own more than one residence. One residence may be close to the main location of work, another away in the countryside or in a small town for vacation periods, a third for intermediate purposes may be located either in a central city (where useful complementary contacts can be made recurrently) or in a peripheral weekend place for brief periods of relaxation and entertaining.

Census figures do not account for this new nomadism or rather "transhumance." These people move within the week or the year between several places in more or less regular fashion. The legal domicile may be at the spot most advantageous in terms of voting and taxation. The census will usually count individuals as living at their legal domicile, even if they spend most of their days and nights at another residence, classified as "secondary" in legal terms.

In France, for instance, there are many advantages, even for notables of large cities, to claim as their official residence a country home which may be in a small and perhaps distant town. The smaller place derives a twofold advantage from such absentee citizens counted there by census; it adds to the subsidies received from the central budget and to its official political weight. In the last twenty years the central city of Paris has officially lost about 600,000 residents according to census count, yet in the same area and period the total number of housing units has increased by 210,000! This expansion was largely due to new construction, and there are few vacancies.

How is this discrepancy to be explained? Partly the expansion of housing may be caused by transients coming at frequent intervals to transact business in Paris. Partly it is a different phenomenon: many persons who spend most of their time in Paris, who in fact live and work there, are officially domiciled elsewhere. The distance between the two places of abode may be a few dozen or hundreds of miles. How many people have already adopted such a transhumant, geographically pluralistic way of life is not known, but the indications are that their num-

ber is large and growing. The trend affects almost all large cities in France, but not in France alone; it may be true even in Massachusetts.

The town of Antibes, on the French Riviera, was originally called Antipolis in ancient times. The word did not mean "against the city" but rather "the city opposite" or "the advanced city." Antipolis was meant to designate a new stage of a growing network centered on a metropolis. The present transhumant society, within megalopolis or between a megalopolis and an antipolis, could not exist in today's tightly organized professional communities without good linkages by telecommunications and particularly by telephone. To this category of urbanites the telephone has given, as it did for isolated farmers, invalids, and bureaucrats, a heightened sense of security. Owing to the telephone network, the transhumant remains within easy call of his main center of living and activity. Frequent and even irregular moving from one place to another does not endanger the system of connections on which the individual's life is founded. This mobility may, however, seriously undermine the political and social structure of the large city's community when its leadership becomes transhumant. With its increasingly pluralistic habitat, our society needs to rethink the structure of the city more seriously than ever (Gottmann, 1976).

These problems are due to the concurring effects of several factors. They might not have developed, however, without the opportunity provided by the telephone. In many ways the telephone has preserved and enhanced large-city growth and the concentration of transactional business. It has also opened up other possibilities which weaken or reshape the structure of communities. It may be that the social impact of the telephone is so difficult to assess because it is such an adaptable and unobtrusive tool, the use of which is molded by individuals and society to the pursuit of diverse aims.

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15 The Telephone and the Evolution of the American Metropolitan System

Ronald Abler

Stepping over to the telephone, he called up the hotel of the town, and ordered a dinner to be cooked and sent to his home forthwith. "We have a telephone in every house, for use in all the everyday affairs of life," said he. This seemed an improvement even on New York. . . .

Titus K. Smith, *Altruria*, 1895

The dreams of late nineteenth century utopians have been realized. In Titus Smith's day only the wealthy could afford telephones. Local service existed in most cities and towns, but long-distance circuits were still rare. Since then, telephone service has spread to all the nation's cities and throughout most of its rural areas. Eighty-seven percent of the nation's households and 90 percent of metropolitan households had telephone service in 1970.[1] We use the telephone in all daily affairs of life, averaging 540 million local calls and 37 million long-distance calls each day. The integral part of our lives the telephone has now become, has been the work of a century; the changes in national and individual life that demanded and depended upon advances in telephony have reached every part of the nation. The telephone has conquered distance as no other technology has.

GEOGRAPHICAL EFFECTS OF TELECOMMUNICATIONS

The telephone is a *space-adjusting* technique.[2] Telecommunications (like transportation) can change the proximity of places by

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improving connections between them. Other things being equal, an individual will have more contacts with people close and fewer with people distant from him. Thus, any technology that makes it easier to contact people at a distance makes it possible to communicate as though that distance had been shortened. The space-adjusting technology of telephony has now been applied on such a massive scale that for some purposes the nation has become a single, highly interdependent communications network. Much the same can be said of the entire globe. In its ads the Communications Satellite Corporation emphasizes its ability to "take you practically anywhere in milliseconds" by showing pictures of the major cities being pulled together by its circuits (Figure 1).

In the course of a century, the telephone has almost succeeded in providing complete *time-space convergence*. Time-space convergence is the average rate at which places approach each other in the relative space created by a space-adjusting technology. In 1776, for example, a journey between Edinburgh and London took 5,760 minutes. In 1966, the trip could be made in 180 minutes. Thus London and Edinburgh have converged upon one another at an average rate of 29.3 minutes per year (5,760−180/190 = 29.3).[3] Because telephonic communication is effectively instantaneous, it can produce much greater space convergence than transportation technology.

In the early days, for example, placing a long-distance call was time-consuming; it took fourteen minutes to effect a transcontinental call in 1920,[4] and was expensive since it also took eight operators. By 1930, improvements in network structure had cut average service speed to 2.1 minutes; further advances brought an average service time of 1.4 minutes by 1940.[5] Operator toll dialing reduced average connection time to about 1.0 minutes in the 1950s, and customer direct-distance dialing now makes it possible to have a call switched through the national network in less than thirty seconds. The introduction of electronic switching into the toll network will make nationwide telephony virtually instantaneous, leaving only the negligible difference between the times needed to enter seven digits for a local call and ten digits for a long-distance call separating local and long-distance connections in time-space. Assuming an average service speed of thirty seconds for a transcontinental call in

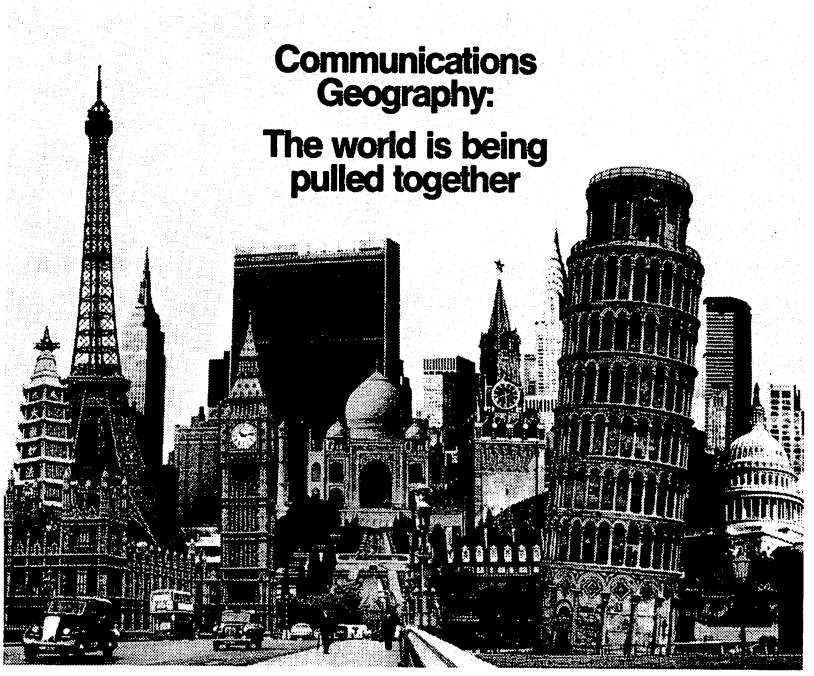

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Figure 1
A Communications Satellite Corporation advertisement. Courtesy of Communications Satellite Corporation.

1970, the time-space convergence between New York and San Francisco averages about sixteen seconds per year since 1920 (Figure 2). Automatic dialers and a completely electronic toll switching network should produce complete time-space convergence and therefore complete independence of contact time from distance (Figure 3) sometime in the remainder of the century.

The telephone network has not yet been able to achieve complete *cost-space convergence*, yet massive progress has been made. Between 1920 and 1970, New York and San Francisco converged at an average rate of 28.5 cents per year as the cost of a three-minute, station-to-station call between the two places dropped from $16.50 to $1.35 (Figure 4). If convergence were calculated in constant dollars, the rate would be even higher because of inflation during the period. Although the telephone system has so far been unable to make costs completely independent of distance, it has come remarkably close to doing so, especially in comparison with early rate schedules and especially over distances in excess of 500 miles (Figure 5).[6]

Consumer response to the telephone network's ability to provide nearly instantaneous communication at ever lower costs has been staggering. Americans now make as many local calls in a month as they did throughout all of 1920, and it takes them just over two week's current toll call volumes to equal the nation's total 1920 long-distance traffic.[7]

The impact of increased capacity for information exchange over short and long distances on the nation's metropolitan re-

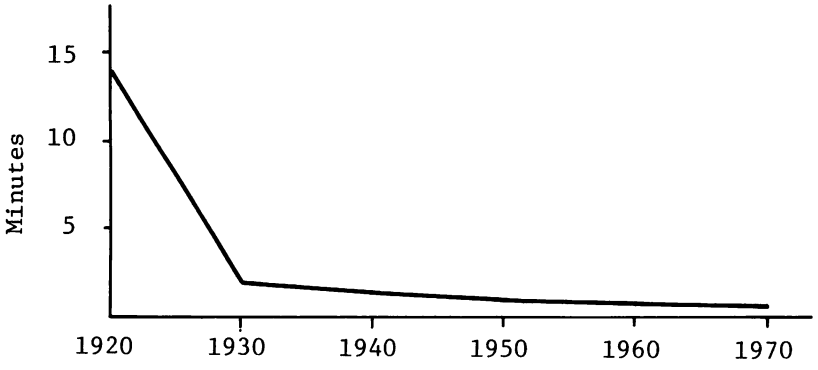


Figure 2
Telephone time-space convergence between New York and San Francisco, 1920–1970. Calculated from sources cited in text.

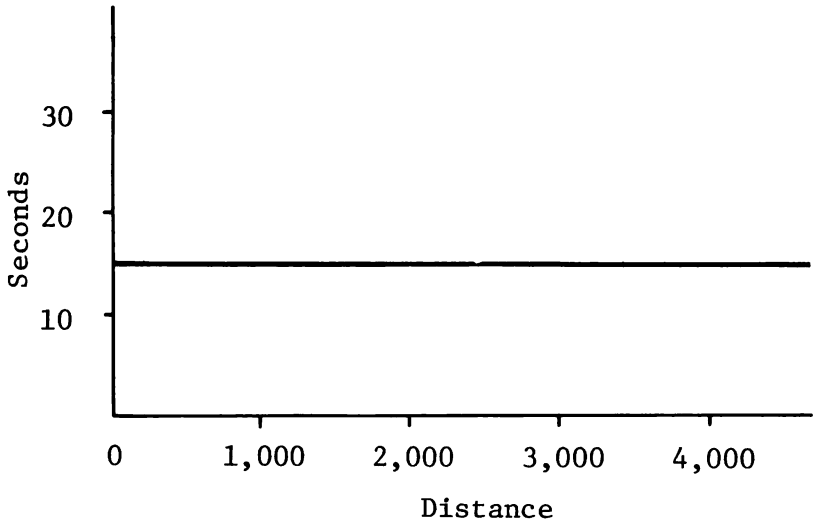


Figure 3
Idealized telephone time-distance relationship.

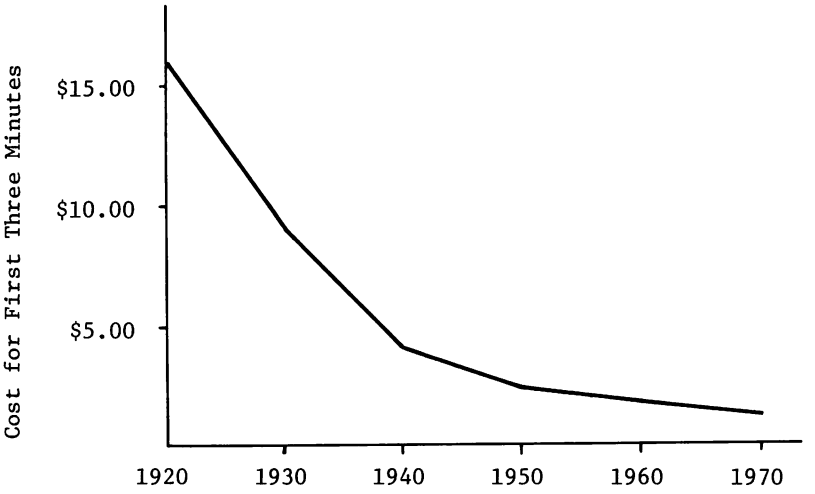


Figure 4
Telephone cost-space convergence between New York and San Francisco, 1920–1970. The curve is a linear approximation of many step-like changes. Source: *Historical Statistics of the United States*, p. 481.

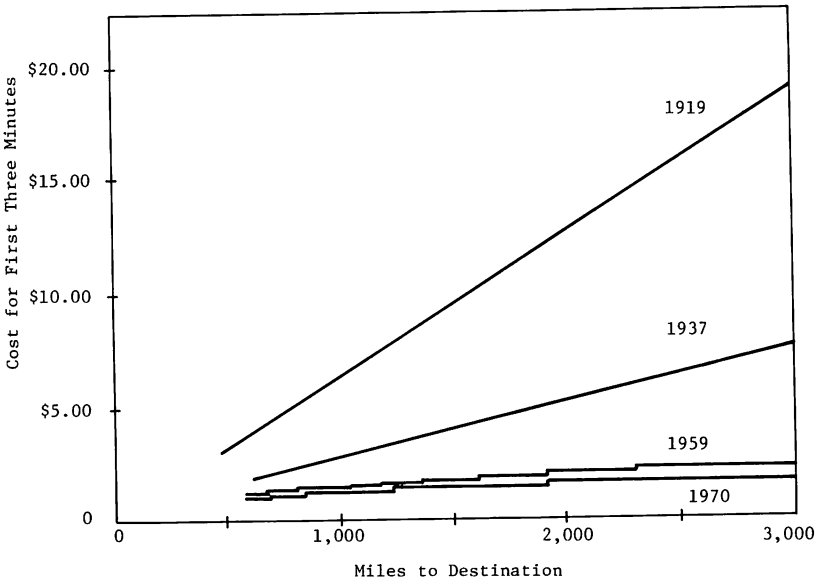


Figure 5
Telephone cost-distance relationship, 1919–1970. Sources: Leland L. Johnson, *Communication Satellites and Telephone Rates: Problems of Government Regulation* (Santa Monica, Calif.: RAND Corporation, 1961). Data supplied by AT&T.

gions has been profound. Its effects are especially evident in the structure of the national economy and in the locations of business activities among and within metropolitan regions.

The nation now has an information economy. To illustrate the importance of information activities in the United States today, the nation's industries can conveniently be divided into five classes:

1. A *primary* group consisting of establishments engaged in extractive pursuits such as agriculture, forestry, and fishing. This group is comparable to the traditional notion of primary industries.
2. A *secondary* group of firms that manufacture tangible products.
3. A *tertiary* industrial sector of firms providing tangible business or personal services such as transportation, maintenance, repair, and custom production of goods (e.g., custom tailoring).
4. A *quaternary* category of industries including those engaged in continuous, large-scale production of information; these are

routine information activities that do not call for major decision-making inputs, such as insurance companies and banks.
5. A *quinary* class of establishments engaging in control activities, including craft (as opposed to routine) information production and nonroutine decision-making. Government is the major quinary industry although private examples (e.g., management companies) exist.
When national production is tabulated according to this breakdown, the growing importance of the information (quaternary and quinary) industries is emphasized (Table 1). Whereas information industries generated a fourth of the nation's income in 1950, in 1970 they accounted for 40 percent of the national output.

The five-category industrial classification can fruitfully be accompanied by an occupational classification that divides the labor force into four categories:
1. *Routine tangible* occupations that involve repetitive production operations in any industrial sector.
2. *Nonroutine tangible* jobs in which tangible goods and services are produced but only on a custom and individualized basis (e.g., a barber or cabinetmaker).
3. *Routine intangible* workers who handle information in a repetitive manner—secretaries, clerks, and most lower- and middle-level management.
4. A *nonroutine intangible* occupational group consisting of those engaged in individualized, nonroutine decision-making; nonroutine intangible workers deal largely with information, but each decision, request for information, etc., is essentially unique.

A cross-classification of these industrial and occupational groupings applied to the nation's labor force produces a twenty-cell matrix providing useful ideas about the evolution of the information economy and the locational behavior of its components.[8]

In 1975, the information industries in the quaternary and quinary categories employed about a third of the nation's labor force (Table 2). Forty-six percent of the labor force now works at information processing (intangible) occupations. Employment by information industries and in the information processing

Table 1
National Income by Industry Sector, 1950–1970

Industries	1950		1960		1970	
	Million Dollars	%	Million Dollars	%	Million Dollars	%
Primary	17,378	7.3	17,161	4.1	24,511	3.1
Secondary	75,869	31.7	120,497	28.9	213,151	26.8
Tertiary	85,387	35.7	146,990	35.2	243,231	30.6
Quaternary	22,153	9.3	48,255	11.6	111,408	14.0
Quinary	37,329	15.6	81,871	19.6	198,938	25.6
Total	239,170	100	417,054	100	795,887	100

Source: *Survey of Current Business*. Totals include the following unclassified amounts: 1950, $1.054 billion; 1960, $2.280 billion; 1970, $4.648 billion.

Table 2
Industrial-Occupational Structure of the American Labor Force, 1975 (Percent of Total Labor Force in Each Industrial-Occupational Category)

	Occupation				
	Tangible		Intangible		
Industries	Routine	Nonroutine	Routine	Nonroutine	Total
Primary	4.01	0.18	0.06	0.12	4.37
Secondary	9.87	5.29	3.64	3.64	22.44
Tertiary	4.95	18.41	10.52	6.86	40.74
Quaternary	0.76	7.69	7.31	8.39	24.15
Quinary	0.36	2.67	2.82	2.43	8.28
Total	19.95	34.24	24.35	21.44	100

Source: Compiled from U.S. Department of Labor, *Tomorrow's Manpower Needs* (Washington: U.S. Government Printing Office, 1969), Bulletin Number 1606. Column and row totals do not sum to 100 because of rounding.

occupations has expanded considerably since 1950 (Figures 6a and 6b).

The nation's increasing reliance on information industries and increased employment in information processing occupations would be impossible without the cheap, efficient telephone services that have evolved during the last few decades. A labor force in which close to half the workers earn their livings by reading, writing, talking, calculating, and deciding would be unthinkable without the telephone's information-carrying capacity.

The ongoing evolution of the nation's information economy is abetting new work patterns between and within cities. Increasingly, each of the twenty cells in the cross-tabulation identifies a distinct work unit that can now respond to its own locational needs and constraints. Once firms were single entities with production, distribution, clerical, and management tasks located in the same place, but modularity is increasingly evident. A large corporation today may have a production plant in one city, its national warehouse in another, its sales office somewhere else, and its corporate headquarters in yet another place. Telecommunications and air transport have made dispersed operations possible for business and government. Plants and offices scat-

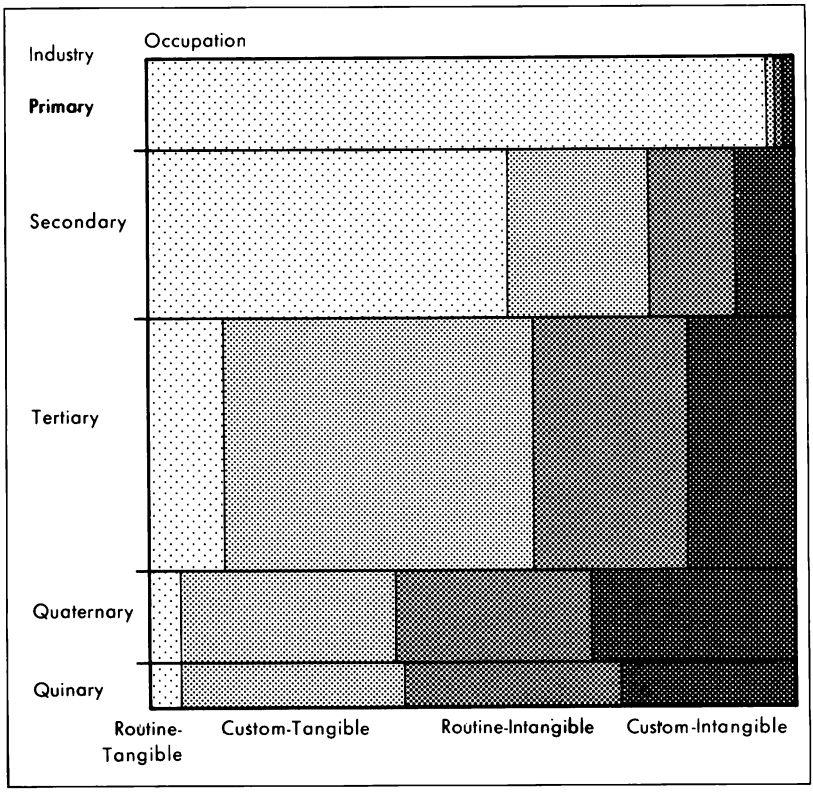
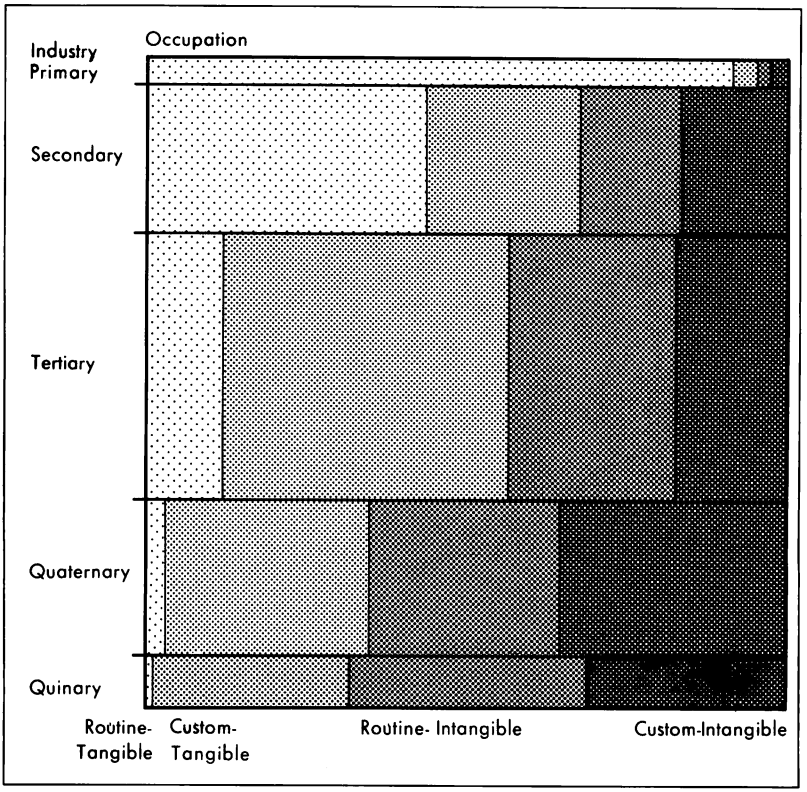


Figure 6a

Industrial-occupational structure of the American labor force, 1950 and 1975. Sources: United States Census, 1950; U.S. Department of Labor, *Tomorrow's Manpower Needs*, Bulletin No. 1606 (Washington, D. C.: Government Printing Office, 1969).



1975

Figure 6b

tered over the nation—each at the best location for carrying out its particular task—can function as single productive units.

A corollary is that many advantages formerly possessed by information-rich locations, such as New York City, are disappearing. The external economies available to information industries in New York City have traditionally been one of its overwhelming locational attractions,[9] but New York City is no longer attracting information activities at the rate it once did. A study of trends in office employment revealed that the proportion of the nation's central administrative jobs (corporate headquarters employment) in the New York metropolitan region declined from 20.8 to 18.7 percent between 1954 and 1967; the share of the nation's central administrative jobs in the twenty-one largest metropolitan areas declined from 69 to 65 percent.[10] The losses are products of more rapid headquarters growth in small metropolitan areas rather than absolute losses in the larger centers, but corporate headquarters and other office jobs are in general dispersing among metropolitan areas. [11]

Metropolitan areas now scramble for corporate headquarters and their thousands of office workers the same way cities once courted manufacturing plants. Atlanta extolls its appeal as a headquarters city in full-page advertisements in national magazines (Figure 7). The New York State Department of Commerce fights back with full-page ads in the *New York Times* proclaiming New York City "Corporate Headquarters, U.S.A." and asking "How come New York has more corporate headquarters than the next eight cities combined?"[12]

The same competition prevails locally, with central cities struggling to keep information activities downtown and suburbs trying to lure them away and attract new growth. Despite increases in office employment in the metropolitan area, New York City lost an estimated 40,000 white-collar jobs between 1969 and 1974; of these, 20,000 were jobs in headquarters offices.[13] Similar trends are evident in metropolitan areas throughout the nation, and in most places office employment in suburbs is growing more rapidly than it is downtown.

The telephone's role in the dispersal of information activities at national and metropolitan levels remains murky. In the literature on the location and relocation of information activity, this factor is never mentioned by movers or those deciding where to

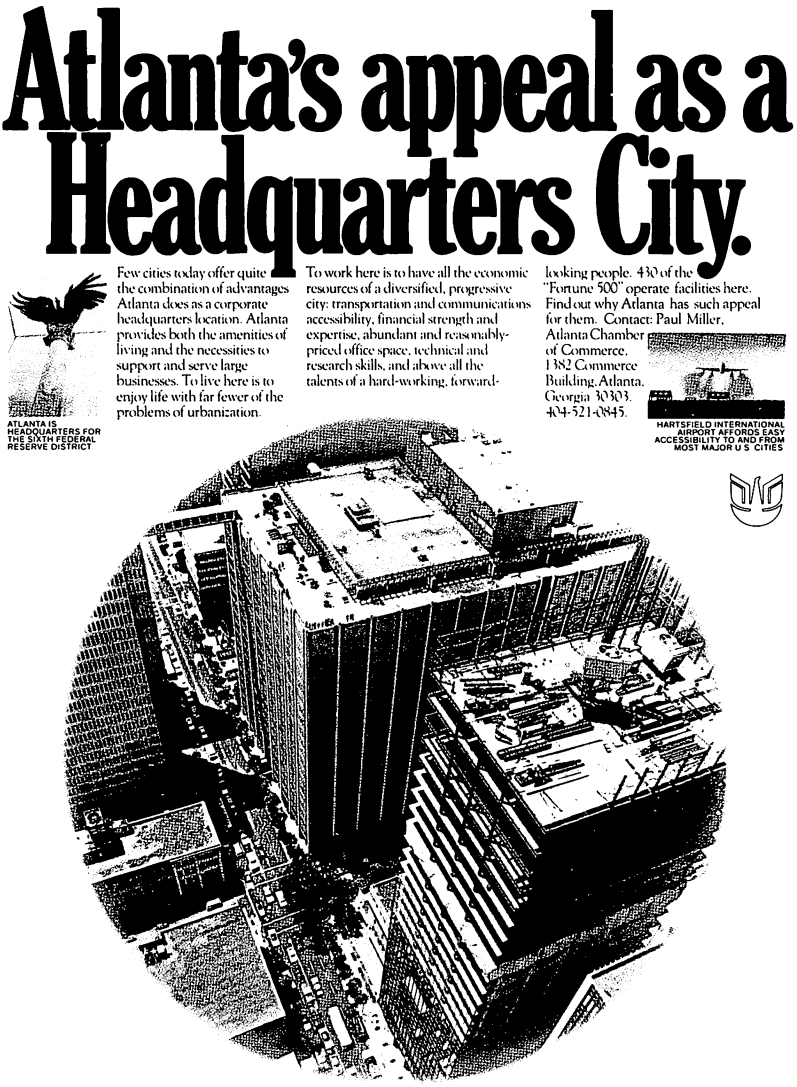


Figure 7
Advertisement to attract corporate headquarters.

locate new facilities, which suggests that adequate telephone service is taken as a given. This is especially true at the metropolitan level, where the general quality-of-life criteria seem to be more important than hard-headed business considerations.[14]

The telephone's major impact on locational behavior has probably been at the national level. National telephone service has been a technological reality since 1915, but the costs of toll calls limited their widespread use of the network, even for business, until well after World War II. Rate reductions for long-distance calls in the 1950s and 1960s complemented the ongoing evolution of the nation's economy by making it feasible to manage and coordinate widely dispersed facilities. The net effect has not negated the advantages of locating in metropolitan areas, but it has put all these areas on a more equal basis in competing for information activities.

At both the metropolitan and national levels, telephonic communication and its offshoots have acted as necessary rather than sufficient conditions of dispersal. The dispersal with integration that has occurred to date is unthinkable without telephonic communication, but that does not imply that the telephone *caused* dispersal in the normal sense of the word. The telephone network made it *possible* for dispersal, which had other causes, to proceed. On balance, the effects of the availability of telephone technology have been more revolutionary for the nation's metropolitan system than at the level of the individual city.

TECHNOLOGICAL EVOLUTION

Achieving the efficient, inexpensive telephone service that is prerequisite to intermetropolitan locational freedom has been long and difficult. Until the 1890s, telephone service was largely confined to cities and their immediate vicinities. Signal attenuation problems had to be overcome before long-distance calling could expand significantly.[15] The toll network began with open wire strung on poles.[16] The predecessor of AT&T, the Interstate Telephone Company, was organized to build such a long-distance line from New York City to Boston in 1880; large-scale construction of an integrated toll network came later. In 1890, the AT&T network was still largely confined to New England, with one salient reaching north and then west in the Hudson–

Mohawk corridor and another extending southeast in the Washington–New York corridor (Figure 8).

The network expanded rapidly after 1890, reaching Chicago by 1892. The years 1894 and 1895 were devoted to filling in gaps in the New York–Chicago corridor; very little expansion occurred in 1895. Two years later, the network had spread west to the Missouri and into the South along several axes, and for the first time, large enclaves with AT&T service appeared in advance of the main network. On the original network maps, they are shown connected to the main body of the network by projected lines. Thus AT&T's organizational efforts spread in advance of the integrated network in some places, for the connections among towns in the outliers are shown as completed. Little extension occurred in 1898, but by 1900 the system had filled in more of the East and was beginning to push west again in Nebraska and North Dakota. At the turn of the century, the nation's West remained outside the AT&T network, presumably with only local or short-range toll service.

Four more years of network construction brought AT&T interconnection to large parts of the West. The coast and northern interior were unified, but much of Nevada, Arizona, New Mexico, and the western Great Plains were not connected to the AT&T system; nor were the eastern and western halves of the network connected. Transcontinental service awaited the development of electronic signal repeaters, which became available in 1914. The first transcontinental line, consisting of four strands of open wire, was completed in 1915.[17]

A map published in 1906 shows virtually no change in net-

Figure 8
Growth of AT&T toll network is shown by shading each county for the year in which one or more towns in each county were connected to the AT&T toll network. Thus the areas in black represent the approximate extent of the AT&T network at the dates indicated. The maps presented here are based on route maps published by AT&T; the last extent map for each year was used to compile this series.

Because only AT&T maps were used, this series may understate somewhat the extent of toll service in the nation, for it does not show toll circuits of independent telephone companies. Interconnections among independents were usually local, however, and of limited effectiveness because of AT&T's refusal to provide toll interconnection to independent telephone companies before 1913.


1890
1895
1891
1897
1892
1898
1893
1900
1894
1904

work extent from the 1904 map, especially in the West. A 1916 map indicates the inclusion of virtually all counties in the East and some additions in the West but surprisingly little extension of the network into the plains and intermontane areas that were unserviced on the 1904 map. The 1916 map does shows the route of the transcontinental circuit, and a separate trunk circuit extending from New York to Miami. Network maps for 1923 and 1929 document a gradual filling in of the unserviced areas and the building of a trunk route network throughout the nation. With the exception of the transcontinental and New York to Miami trunks, the spread of the trunk network seems roughly to parallel the earlier network of short-haul connections.

Completion of the national toll network in the 1920s brought AT&T face to face with a host of technological problems. Signal attenuation with distance and in the multiple switches required to complete even short- and medium-distance toll calls was severe. The first nationwide plan for providing good random access service was put forth in 1925.[18] Implementation of the original plan and modifications, coupled with the progressive development of new transmission and switching techniques, culminated in the direct-distance dialing programs introduced in the 1960s. The application of electronic switching in the toll network begun in 1976 fulfills a persistent goal of network design since 1925; it virtually eliminates the differences between the handling of exchange and toll messages.[19] Only differences in price remain.

The fascinating history of telephone network evolution has only been touched upon here, but three important conclusions can be drawn from what has been reviewed.

First, it has taken a long time to develop efficient, nationwide telephone service. Within a year of Morse's 1844 demonstration of the practicality of his telegraph, some 30,000 miles of telegraph wire had been put into service. A transcontinental line was completed to San Francisco in 1861.[20] Telephony is a higher order of communication than telegraphy in that it conveys much more information; progress toward a national network was accordingly slower. Despite the rapid spread of local telephone service throughout the nation, long-distance service scarcely existed two decades after the telephone's invention and it was forty years before service on a continental scale became possible.

More importantly, only after World War II—almost seventy-five years after the invention of the telephone—did toll calls become available at prices that permitted widespread toll calling.

Second, the telephone network was and still is an expensive machine; the value of the nation's telephone plant in 1970 was about $60 billion, 6.1 percent of the 1970 gross national product.[21] Since 1900, investment in the nation's telephone service has consistently outpaced increases in gross national product except during the depression and World War II years (Figure 9). In 1970 alone, $10.1 billion was invested in telephone plant and equipment, an amount that was 12.7 percent of the $79.7 billion total business expenditures for new plant and equipment in that year.[22] Until the 1950s, large capital requirements meant high toll rates that discouraged consumer use. The ratio of local to toll calls stayed almost constant at 40:1 from 1900 through World War I; thereafter the ratio fluctuated from 31:1 in 1920, to 22:1 in 1945, to 27:1 in 1950. Since 1950 the ratio has declined steadily to 23:1 in 1960, 17:1 in 1970, and 15:1 in 1974, the latest year for which data are available.[23] Before toll service could achieve widespread use, rate reductions following automation of the nation's toll network had to reduce prices to levels competitive with other means of communication.

Third, the major technological obstacles to efficient and inexpensive nationwide network operation have been switching problems. There have been many important advances in transmission technology over the decades, and our national network could not exist without them. But increases in transmission capacity have generally preceded development of the switching devices needed to handle the traffic they generate because of the combinatorial nature of random access networks. The number of possible two-way interconnections in a telephone network is $N(N-1)/2$, where N is the number of telephones in the system. Each telephone added to the network imposes astronomical numbers of new possible connections, for which switching capacity must be provided. In a network with 120,000,000 telephones, there are 7,199,999,940,000,000 possible pairs. Increasing the number of telephones to 120,000,001 increases the number of possible pairs to 7,200,000,060,000,000, which is 120,000,000 more than the number of possible pairs in the network before the new phone was added, for the new telephone

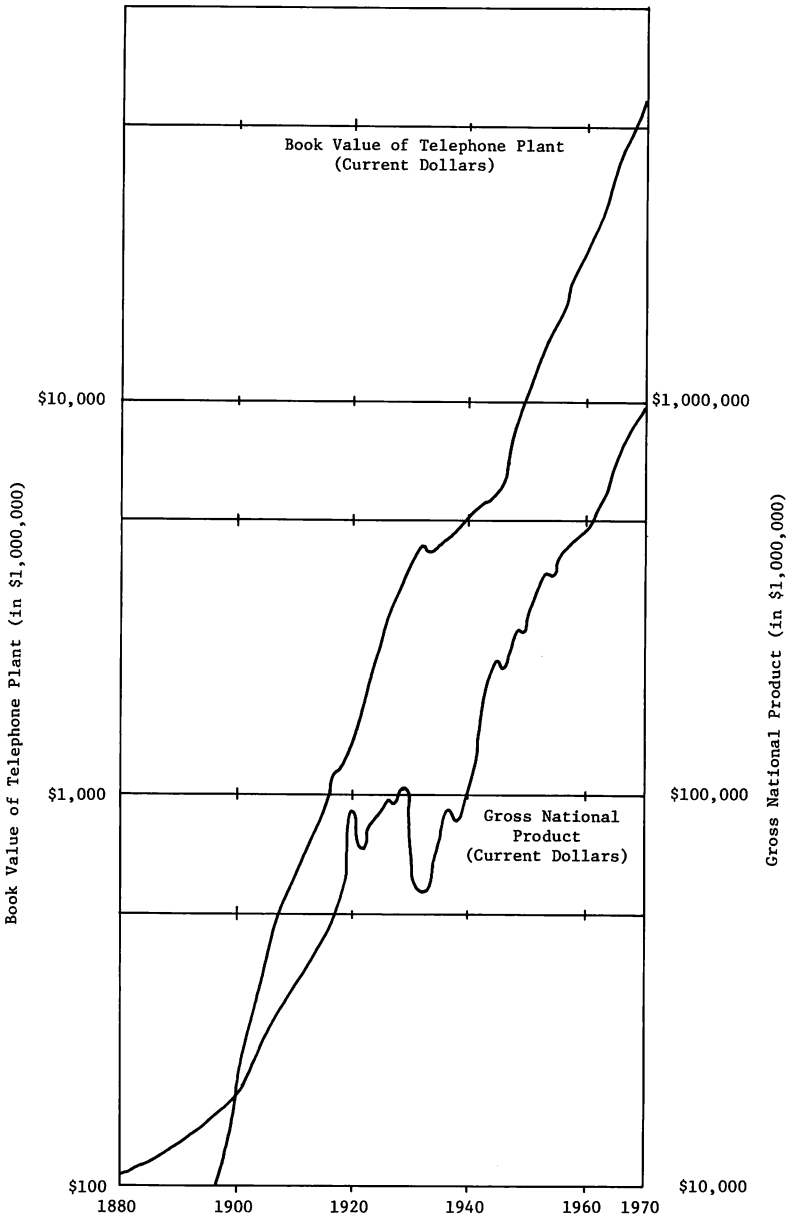


Figure 9

Book value of telephone carriers reporting to the F.C.C. and Gross National Product, 1880–1970. Sources: *Historical Statistics of the United States*, pp. 139, 481–482; *Statistical Abstract of the United States, 1974*, p. 374; *Statistics of Communication Common Carriers, 1972*, p. 19.

must be provided with a possible route to each of the 120,000,000 telephones already in the network. Careful design of the nation's hierarchy of toll trunks and switching centers makes it possible for a new telephone to reach any other telephone in the nation with a minimum of new routes, but the increasingly complex switching arrangements needed to provide nationwide, high-volume long-distance capacity are a direct consequence of the number of possible connections in the national network and the way that number increases with each new telephone.

PROSPECTS

It is helpful to reflect upon the telephone's history and its effects on cities, for utopians are once again abroad in the land.[24] Whereas the descriptions of telecommunications and its impacts authored by Titus Smith and others (such as Edward Bellamy) were clearly utopian, modern utopians who are entranced with electronic communications write forecasts rather than fiction.[25]

If current commentators are to be believed, an electronic communications complex revolving around two-way cable television (CATV) will soon free the nation's cities from existing geographical constraints. The high proportion of the national and metropolitan labor force working at information-processing jobs and advances in telecommunications will, by 1990, allow managerial, professional, and clerical personnel to work at home, substituting electrical communications for face-to-face contacts which generally relate to routine matters not requiring physical presence.[26] Nicholas Johnson, former FCC Commissioner, described the ultimate vision as a "home communication center where a person works, learns, and is entertained, and contributes to his society by way of communications techniques we have not yet imagined—incidentally solving commuter traffic jams and much of their air pollution problems in the process."[27] John R. Pierce suggests: "We can live where we like, travel for pleasure, and communicate to work."[28]

In the context of the evolution of the telephone network, such forecasts and the general literature they represent must be classified as utopian. There is little doubt that over the very long run we shall enjoy the benefits electronic utopians describe, but

we are at least as distant from them today as Titus Smith was from direct-distance dialing, for the fundamental constraints that governed the evolution of telephone service will also control the development of new telecommunications technologies.

Video communication is a much higher order of communication than voice communication. We can, therefore, reasonably expect that building a nationwide, random access video communications network will take longer than did the construction of the voice telephone network, which in turn required more time and money to build than the telegraph network. Current CATV technology delivers one-way, unswitched video signals of rather poor resolution. Despite the rapid advances being made in digital transmission via waveguides and optical fibers, I remain unconvinced that the nation will have anything even approaching two-way, random access video communications at the turn of the century. Random access will be particularly difficult to achieve because it will require switching technology that barely exists, on a scale, in terms of information carrying capacity, that is almost unimaginable.

The cost constraints are more serious than technological problems. An investment of $15,000 per video terminal has been estimated as the capital required for a nationwide video network.[29] E. Bryan Carne has estimated the aggregate cost of a nationwide video network at a trillion dollars.[30] The nation's 1971 gross national product was about a trillion dollars,[31] and in the same year, the telephone network was worth about $60 billion.[32] Additional evidence that building a nationwide video network will be a long, hard job can be adduced by historical analogy. In 1958 dollars, the 1971 gross national product was $750 billion, and the book value of the national telephone complex was $45 billion. In those terms, the nation first had a $45 billion gross national product about 1890, when the construction of the long-distance network began.[33] It seems to me that it will take a similar period of time to build a video communications complex with a value equivalent to the 1971 GNP.

Should a random access telephone system eventually provide the comprehensive services currently envisioned, its evolution may be accompanied by dispersal of information activities and people with information processing occupations. I doubt, however, that the causal role telecommunications will play in such

dispersal will be anything other than what it has been in the past—namely, a permissive technology that is a necessary rather than a sufficient condition. Residential dispersal in and around metropolitan areas is as old as Roman villas and Versailles; the only thing revolutionary about urban dispersal in the nineteenth and twentieth centuries is the number of people who could afford it. The trend toward dispersing information activities, which might formerly have remained concentrated in the nation's largest metropolitan centers, is more recent and more dependent on telecommunications technology. At that scale also, dispersal is most directly tied to economic development and shifting settlement patterns. The existence of dependable telephone service does not *cause* such dispersal.

The nation's telephone services evolved with the nation's metropolitan regions in a highly complex and circularly casual relationship in which cause and effect are impossible to discern. Much is often made of the dispersal telephone services seem to make possible, but careful examination of dispersal reveals other equally important causes such as ongoing economic development, federal housing policies, and better roads and automobiles. Moreover, emphasis on space-convergence and dispersal overlooks the *space-intensification* that telephone permits; a modern high-rise office building relies on cheap, efficient telephone service just as much as a sprawling suburban office complex. The ambiguous role of telephone technology in the evolution of the American metropolitan system suggests that new telephone services and new communications media will be more evolutionary than revolutionary in terms of their effects on the nation's settlement patterns.

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16

Urban Growth and the Development of the Telephone: Some Relationships at the Turn of the Century

J. Alan Moyer

Much of the spacial structure of a metropolis is the result of more or less independent location decisions by individuals and firms. Many factors influence those decisions (e.g., availability of jobs, amount and cost of space, proximity to family and friends, availability of amenities, accessibility and cost of transportation, availability of services, location of markets, material, and suitable labor, etc.), but attention in the existing literature has focused mostly on transportation. The impact of ships, rivers, canals, railroads, trolleys, automobiles, and trucks has been seen as a key to the development and growth of urban areas. By comparison, communications—specifically telecommunications—has received only passing interest from researchers and has been largely seen as a decentralizing influence. F. J. Kingsbury's early comments about the telephone's impact typify a prevailing view. He states:

> Three new factors have been suddenly developed which promise to exert a powerful influence on the problems of city and country life. These are the trolley, the bicycle, and the telephone. It is impossible to foresee at present just what their influence is to be on the...distribution of population; but this much is certain, that it adds from five to fifteen miles to the radius of any large town.[1]

Communications as a factor has been treated mainly in discussions of physical proximity of firms and individuals. Communication costs are normally considered part of the "agglomerative economies" associated with physical proximity. Such proximity is necessary to the specialization of occupations that is at the core of urbanism. Specialization makes individuals depend upon one another and upon interaction in a variety of forms: direct tactile or visual contact, face-to-face conversation,