

Urban Form in the Modern World

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The Emergence of the
Complex City, 1845–1945

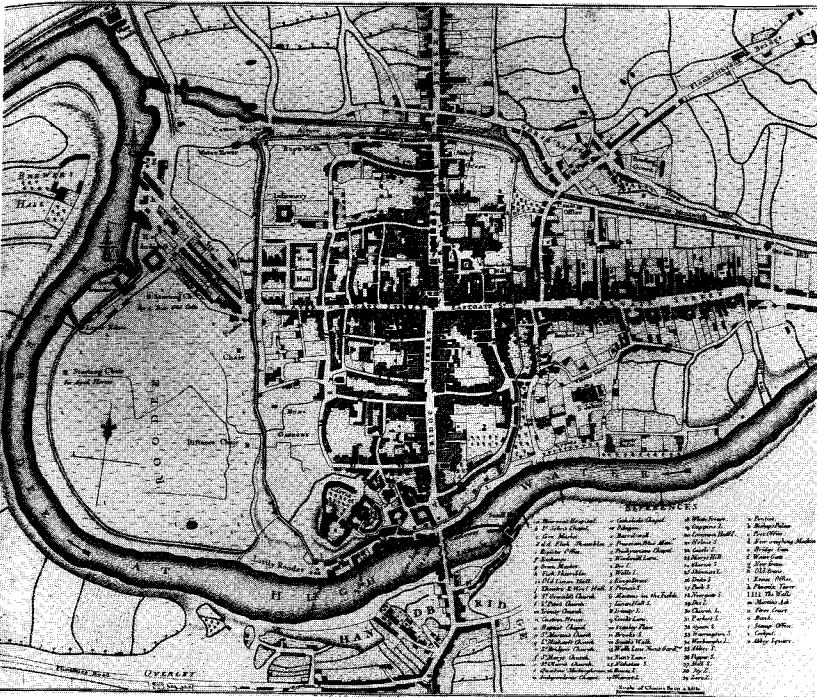
*Lowell Mill Yard,
courtesy of John
Rogers Flather,
Lowell.*

The antiquity of cities, widely understood, tends to hide from us a clear perception of the physical structure of the modern metropolis. The misunderstanding comes from a failure to give sufficient attention to the processes at work in the shaping of cities. For three thousand years urban places have housed a variety of activities—the religious function of the acropolis was almost immediately joined by governmental and trading activities and ultimately by educational, social, legal, and cultural undertakings that would controvert any notion of the single-purpose city. At the same time urban morphology remained remarkably simple. There were specialized buildings—the stoae and basilicas for public gatherings, *horrea* for storing goods, and *cenacula* for housing extensive populations, for example—and even discrete clusterings of buildings as in a forum, but in virtually all cities there was a seamlessness to the fabric given by the common dependence on pedestrian movement for transportation. Distinctions existed, particularly those given by social division of clan, class, and religion, but they did not bring forth a morphologically complex city. Only where walling had been undertaken, to be succeeded by unsecured construction beyond the gates, was there clear diversity, giving us our first morphogenetic division into *urb* and *suburb*—that incrementation beyond the walls of the city. The clear distinction between the polar extremes of city and countryside was maintained and the ambiguity of the suburb was commonly resolved after a relatively short time: physically by the building of a new and more encompassing wall, and legally by the concept of a politically expanded city—the *contado* of the city in Italy or its liberties in England. Society and the structure of its largest artifact tended toward simple, if all-powerful, distinctions between city and countryside, with cities gaining a special importance from the small portion of the national population living within them.

The change in the role of cities was not instantaneous, as few evolutions are, but the shifts came in a sufficiently rapid fashion to allow us to look upon the hundred years after 1850 as a great transformation in urban geography leading to the creation of the complex city, diverse in morphology as much as in economy, society, and culture. The driving force of this transformation was the great increase in the scale of urbanization, leading to, among other things, a level of geographical specialization to match the much older building specialization begun in classical times. That spatial division was engendered by the rapid increase in size of cities and was given a structure by the rapid increase in the complexity of transportation available for the use of city people.

The city of pedestrian movement by citizens had, of necessity, to be as small in area as possible. Not all such places were as compact as might be desirable. Classical Rome, medieval Milan, late-Renaissance Paris, and Restoration London were all larger than was convenient, and each had to lean heavily on water transport to bring in the food its people needed, in

The Continuing City



In 1794 Chester still showed the medieval development of a Roman castrum, with the cardo and the decumanus forming the medieval high streets and burgage plots, clearly suggesting centuriation of Roman times. The Roman wall, transformed only moderately over the centuries, can still be seen, and the small change in the scale of the city over nearly two millennia is evident.

From John Aikin, *A Description of the Country from Thirty to Forty Miles Round Manchester* (London: Stockdale, 1795).

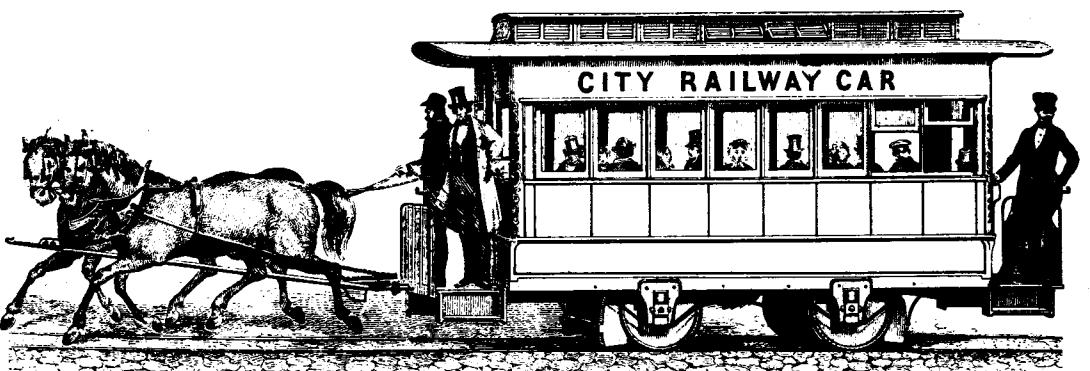
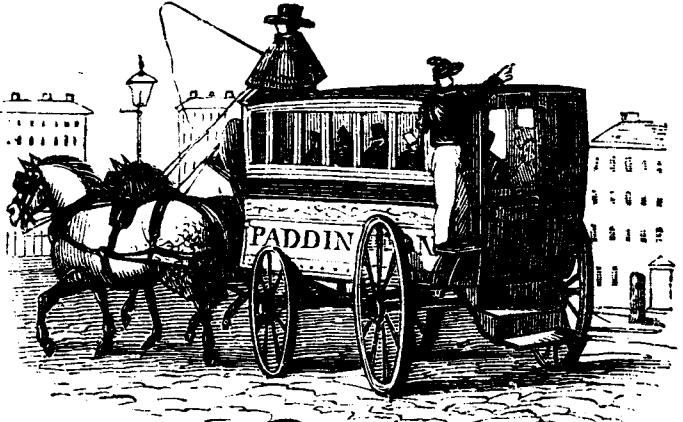
quantities beyond the provision of the immediate vicinity. It seems reasonable to argue that these cities, giant for their time, could not have existed without a cheaper and more comprehensive form of external transportation than was available within their city bounds. Thus, their absolute populations could increase well beyond the common value for cities of their period, forcing great crowding within those bounds as no effective substitute for walking in internal transportation had yet been found. We cannot say that it was only in the middle of the last century that cities were seen to be hampered by the absence of effective alternatives to pedestrian movement; we can say that the problem then became so exaggerated in a few large cities and so widespread with the growth of many sizable cities that more earnest efforts were made to find practical alternatives.

Evolution of Transportation and the City

In the seventeenth century in Paris, and the eighteenth in London, experiments had already been undertaken in a search for vehicular transportation. The results were successful enough to show the considerable utility of such movement but not cheap enough to permit broad use of the horse-drawn vehicles involved. It was only in the nineteenth century that much success was obtained in creating truly public urban transportation. The development of the omnibus, first in Nantes in 1825 and then in Paris three years later, began the democratization of urban transport that was a generation later to

The Emergence of the Complex City

An omnibus in the middle of the nineteenth century.



The horsecar became le chemin de fer Américain because it was developed and so widely used in the United States.

transform the structure of cities. New York City added the next improvement, the horse-drawn streetcar, which in 1832 broadened the class-utilization of transport, demonstrating the wide geographical field open for development. Although the omnibus had been taken up rapidly, the more commodious, and thereby cheaper, streetcar took twenty years to gain very wide utilization. Only in the 1850s were many American cities served with horse-car lines and did the technology reach Europe through *le chemin de fer Américain* launched in Paris in 1853, the beginning of the era we here consider.

Before we take up the transformation of the traditional structure within the urban bounds, it is necessary to consider the contemporaneous answer to a nearly timeless question: what were the differences between the city and the countryside in the matter of transportation? Until the nineteenth century both areas had been basically served by pedestrian movement. In the countryside, where animals were a necessary element of most agriculture, draft animals could be used for haulage, but they were perhaps not much more available to the common country folk for riding than they would have been in

The Continuing City

the city. The curious and the enterprising seeking to reach the horizon did so mainly on foot.

The quickening of economic activity—consequent upon the Mercantile Revolution of the seventeenth and eighteenth centuries—reshaped cities as merchants' towns and ports; it also remade much of the countryside and in doing so forced a Transportation Revolution there as well. Larger markets of a mercantile empire, such as England's in America, India, and Africa, called for a larger product of even fairly traditional industries such as the country woolen manufacture of Gloucestershire, East Anglia, and the West Riding. Iron was demanded in greater tonnages. Cotton was introduced and quickly became the staple for a burgeoning textile industry, particularly in Lancashire. Much of this growth took place in the countryside, where some unused or at least purchasable waterpower could be found and where changes in agriculture were making workers available for enlarging factories. Although the United States was not the seedbed of this industrialization, due in considerable part because of the restrictions that a mercantile Britain placed on such activities in its colonies, country manufacture was a hidden presence before independence and a critical national goal after 1783. After that date there was as urgent a push to provide the infrastructure for manufacture in the New Republic as there had been in the former metropolis. And that creation of facilities looked particularly to the shaping of a transportation more efficient than the plodding of draft animals and the trudging of people.

In this effort a striking contrast emerged between the republic and the former mother country. In Britain it was a shortage of waterpower that forced industrial growth into cities, where the various processes involved in creating textiles and metal products could be undertaken in separate steam-powered factories. This medieval practice, which saw the "mysteries" of a single process in a chain of fabrications restricted to a distinct gild in its particular occupation quarter of a city, became a force in shaping the industrializing city. Where in the Middle Ages gilds, each with its specific process, had had different quarters, though commonly adjacent one with the other, in the emerging city of the Industrial Age that process-distinction was maintained but now in separate, if adjacent, towns. Parts of an industrializing town such as Manchester or Birmingham, or later industrial satellites nearby, became the home for a particular process, rather than the full fabrication from raw material to finished product. In the United States there was no such medieval practice in most instances. During the colonial period most industrial activity had been illicit, and the point need not be tortured that in that circumstance the fine distinctions of custom and traditional practice tend to be forgotten. Pragmatism emerges in control where the constraint of custom and common law are absent within a surreptitious pursuit. Simply stated, in the United States manufacturing had tended to undertake to carry out all the processes in the creation of a product within one household when such activity had to be clandestine; when manufacture became legal, there was no tradition or law to obviate the joining of all processes in a single plant. The slavish copying of British practice by Samuel Slater in the 1790s had interrupted what might be seen as the

"American practice" of carrying on process-clustered production, but with the advent of the Boston Manufacturing Company in Waltham in 1814 we resumed our tradition.

Returning to the question of the transportation infrastructure for industrialization, both Britain and America greatly needed improvement in transport within the countryside, though for somewhat different reasons. In Britain the shortage of waterpower forced additions to industry to come near the alternative source of power, that is, coal for the operation of steam engines. With an inheritance of mercantile towns from an earlier period and a considerable history of manufacture even in the Middle Ages, the successor steam-powered factories tended to be located near sources of orders for goods (mercantile towns) and investment capital (then largely mercantile in origin). The towns near coal fields gained an edge: Manchester became the metropolis of the new cotton-textile trade; and the West Riding of Yorkshire held on to its role as the heart of one of the English woolen districts. Possessed of coal fields that East Anglia and Gloucestershire lacked, the West Riding became the metropolis for English wool. From its medieval iron trade, Birmingham with its Black Country came to dominate all metallurgy in Britain. Canals and later railroads were built to bring coal to these industrial metropolises, allowing cities and their industrial satellites to burgeon.

In the United States waterpower was plentiful throughout the Appalachians, though New England seemed initially favored because glaciation had provided ponds and lakes that tended to even out the flow of streams in the face of seasonal contrasts in rainfall. And, as in Britain, the Yankees had both the mercantile towns to furnish the requisite orders for the product of factories and the mercantile capital for the building of those plants. In New England water was an even more dispersed source of power than Britain's coal had become. To make use of it, however, the same improvement of transportation was required. Manufacture was similarly tied to the availability of power, but with waterpower—before the development of electricity—it was necessary to take the plants to the power rather than the power to the plants, as in Britain. For this reason it should not surprise us that the earliest canals in America came in New England and that the first network of railroads was developed there.

This industrialization in the early years of the last century caused great improvements in the infrastructure of rural transportation in the English Midlands and North, and in New England and the northern Appalachians. By 1850 a comprehensive network of railroad lines was available in each area, such that industrialization and urbanization could approach a scale never before thought possible, let alone reached. Through the much enhanced rural transportation—initially sought by canalbuilding and canalization of rivers, though ultimately accomplished through the much more adaptable construction of railroads—a new system of urbanization became possible. Britain experienced two major changes: the growth of vast cities of complex economic structure and great areal extent, which came in this century to be called conurbations, and the considerable enlargement of what had been medieval market towns to become cities with industry as well as

The Continuing City



trade. In the United States the railroad allowed the growth of two types of settlement not found in colonial times: the industrial satellite, which at first tended to spring up near the mercantile ports that supplied its market and the capital for the construction of its factories, and suburbs that became the location for the residential incrementation to the older traditional cities. Suburbs had existed in medieval cities, on a very small scale, and they sprang up around Paris and London after 1830, when the omnibus provided intra-urban transportation. It was in America, however, that the suburb was seen as the normal and desirable form of urban residence made possible by the building of railroads. Those lines had not been constructed to bring suburbs into existence, though once lines were laid out they allowed suburbs to burgeon in what had been rural villages located along the rail line.

The geographical pattern of suburbs differed between Europe and America. Around Paris, London, and several other large European cities suburbs came mainly in the form of "villa districts" built close to the borders of the traditional city and first engendered by the construction of large and expensive houses for those possessed of private carriages. The coming of the omnibus made such locations as St. John's Wood and the other areas north and west of Paddington in London possible residential sites for an upper middle class not always possessed of carriages. The developments were seen as somewhat pastoral, but the morphology of the additions tended to be

This diagram of the railroad lines radiating from Boston in 1851 shows how the first of all railroad hubs had most effectively used its outburst of lines to develop some of the oldest suburbs, first based on railroad stops in the country around cities.

The Emergence of the Complex City

similar to that found in the Georgian housing estates; the main distinction between them was found in the architecture, which tended to be rather more eclectic in the suburbs. European suburbanization was tightly angular in form, with a parsimonious use of land, a continuity of structure outward from the city center, and a much more characteristic use of attached or continuous building form.

In North America, both the United States and Canada, the suburb was clearly the creation of the railroad, which gave it its characteristic morphology. Carriages and omnibuses were capable of frequent, almost individual stops, but trains were not. Even the earliest locomotives took time to be halted and considerable effort to get under way again. Thus, stops—halts, to the English—had to be spaced out, causing the growth of suburbs to be discontinuous in geographical pattern. What resulted were bead-pattern strings of suburbs originally divided one from another by remnants of the open rural ground in which they sprang up along rail lines. The fundamental contrast between Europe and America probably came at first from the service characteristics of the transportation that initiated suburban development. But the openness of American suburbanization, as contrasted with the European compaction, undoubtedly represented the differing conceptions of land found on opposite sides of the Atlantic. Europeans viewed land both as scarce and as the foundation for social distinction. Landowners in Britain sought to make available for suburban building small, compact tracts that would still leave grounds and fields for the “big houses” that gave families social status. On the Continent the agricultural and social values attaching to rural lands were such that a similar meanness of suburban provision existed. It was only in North America that suburbanization took place in an environment of a generous land provision. In the United States social status did not depend on landownership in those parts of the country that were rapidly suburbanizing; and the vast stretches of virtually empty land in North America led to the view that there might be a democracy of space. The dispersed and privately owned farms of colonial New England had impressed on the American mind the virtue of private, detached, and individual ownership of housing. This strong cultural inclination was reinforced by the early transportation improvements that allowed suburbanization. The rejection of narrow ownership of land by the Massachusetts settlers of the 1630s had laid the cultural foundation for the American suburb; the railroad allowed it to grow without serious legal and spatial transformation.

Systematic Change with the Coming of the Railroad

To understand the nature of the large city at the middle of the last century, we must remind ourselves that the development of railroads worked a fundamental morphological shift. The traditional city that stood as the core of the emerging metropolises was compact in the best of cases and horribly crowded in the worst. In the 1840s Britain and other industrializing European nations became aware of, and greatly concerned by, the crowding in cities. Even in basically rural Denmark, Copenhagen had developed some of the most cramped and fetid of tenement areas, a condition equally char-

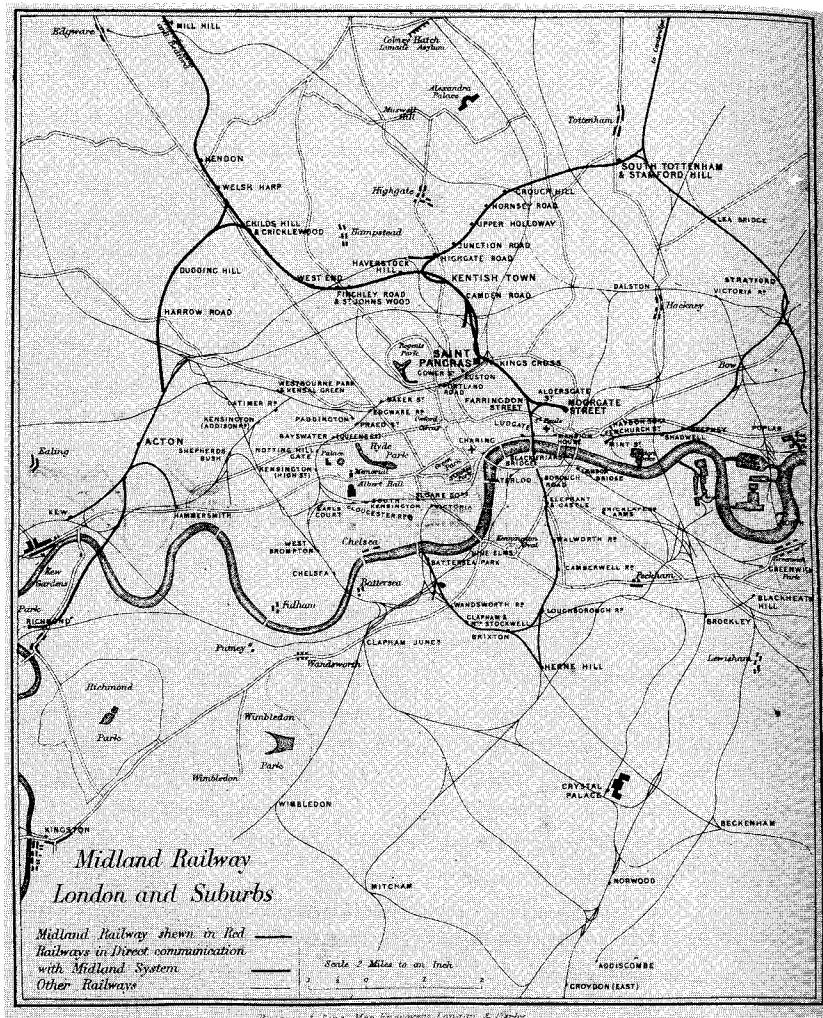
teristic of Naples far to the south. The form of the traditional city of Europe can be thought to have reached a limit of traditional growth by 1850. Studies such as that of the British Royal Commission Studying the State of the Large Towns and Populous Places in the 1840s clearly perceived the problem; they were less effective in conceiving solutions. The problem, we now realize, lay in the exhaustion of the ability of traditional urban morphology to care for the demands of greatly burgeoning populations and increasingly complex cities. As long as city people had to get about by walking, there was within traditional morphology no way out of the noisome growth of the larger places. The obvious solution could be seen to lie in a transformation of that longstanding physical structure in one of two ways: the buildings themselves could be transformed by pushing upward the limits of construction, or the city itself could be enlarged in geographical extent in some fashion by providing a new form of transportation that would allow people, and goods, to move easily over a wider area.

Each of these possible solutions was actively experimented with in the 1850s, allowing us to view that decade as the initial one of the great “urban transformation” that changed both the prince’s capital and the merchant’s town of the seventeenth and eighteenth centuries into the modern metropolis. Before taking up that transformation, we should look back for a moment to what had been happening during the first half of the last century. We have already noted the coming of the railroad, which almost immediately transformed the countryside about the city by encouraging the growth of industrial satellites—equally in England and New England—and before midcentury the railroad suburb had emerged around larger places possessed of a network of rail lines. Boston was the first to have such a pattern, lending a historical justification for viewing the Hub as in many ways the birthplace of the complex city in America rather than the large European cities with well-developed rail systems and similar experiences. New York’s transformation was rather different, because its insular location made the ramification of rail lines awkward. There, instead, it was ferry connections that began suburbanization, a situation shared with San Francisco in the shaping of the Bay Area City. These early railroad and ferry metropolises grew in reflection of the articulation of their characteristic transportation.¹

But those industrial satellites and suburbs at first possessed a geographical isolation that gave to them a morphological distinction. None was a literally continuous extension of the traditional city form; rather, each was an entity located in space in relation to the city but tied to it by rail lines or waterways that left open space as an integral and internalized part of the growth pattern. Large cities of the early to mid-nineteenth century, be it Boston or Hamburg, took on a “planetary system” morphology, with a focus on the traditional city—port, capital, market town, or strongpoint—and the ranging around it of satellites and suburbs. As in heavenly planetary sys-

1. For a discussion of the emergence of the railroad-shaped metropolis, see James E. Vance, Jr., “Labor-Shed, Employment Field, and Dynamic Analysis in Urban Geography,” *Economic Geography* 36 (1960); for a similar view of the emergence of a ferry-shaped sympolis, see James E. Vance, Jr., *Geography and Urban Evolution in the San Francisco Bay Area* (Berkeley, Calif., Institute of Governmental Studies, 1964).

The emergence of suburbs in the London region is well shown by this map of the provisions for suburban rail service by the Midland Railway after it built into London in 1867.



tems, gravitational attraction held this open morphology together, but unlike the heavens, the modern metropolis had direct physical ties, attaching the parts together along rail lines and waterways.

The limitations on movement introduced by the primitive technology of the railroad forced these components of the planetary system to remain initially apart. It was clearly evident to contemporary observers that the space originally built into the system introduced problems and costs that would ideally be avoided. The industrial satellite could not very effectively make use of central-city institutions, stores, or housing; the suburb could not provide housing for the lower economic classes working in the traditional core because of the relatively expensive nature of early rail travel. This latter point is accentuated when we look at the Bay Area City, or New York. In each of those places suburbanization became more economically democratic than in the railroad metropolises because ferries could make better use of the primitive steam engines of the time, thus lowering the cost of that propulsion

The Continuing City

and allowing it to be applied to vehicles of such size that masses of people could be carried.²

The nature of early suburban development—essentially beads of growth at railroad stops in the adjacent countryside—and of industrial satellites served only partially to relieve the crowding of the traditional city. As long as those places remained the reception area for migrants to the city, as they did in the great ports where most of the overseas immigrants landed—Boston, New York, and Baltimore in America, and Liverpool and Glasgow (with respect to Irish immigrants) in Great Britain—crowding probably increased. The general growth of activity in these core areas, consequent upon the increase in manufacturing and trade, put pressure not merely on the housing provision but on that for shops, warehouses, and offices as well. It was in this context that the central-city transformation took place. Still depending heavily on pedestrian movement, the heart of the emerging metropolis had somehow to be enlarged in a way that would permit it still to function with people moving on foot. The answer to this was great density of land use but without actual additional crowding within buildings, as these were physically enlarged now through the construction of taller structures. The general height of city-center buildings began to increase using traditional building technology, stairs for access to upper floors, and masonry walls to carry the additional stories. Obviously each of these aspects of incrementation had its faults. Too many flights of stairs were thought intolerable for all but the most disadvantaged—the origin of the concept of the garret for the poor—and more stories borne by masonry walls meant that those had to be thickened to such an extent the ground-floor space was sharply reduced.

The Rise of the Skyscraper

The solution began to appear in the 1850s with the first use of elevators and the early efforts to create what came to be known as skyscrapers. It has been argued that the skyscraper was distinguished from earlier tall structures, such as the spire of Ulm Cathedral, which rose above five hundred feet even in late medieval times, by the possession of three structural characteristics. The first, “well-above-average height” was, of course, shared by all tall masonry structures of the Middle Ages and Renaissance, but two were distinctive to the skyscraper and very much the product of the middle of the last century: the installation of the passenger elevator and “the employment of cage and curtain-wall construction.”³ It is impossible here to detail the adoption and evolution of these structural features beyond merely noting that around 1850 these two elements began to come into large-city construction, particularly in New York. But with the rebuilding of Chicago after the fire of 1871, a more innovative adoption of the form was undertaken, and by the end of the century the skyscraper was viewed as a distinctively American

2. For a discussion and analysis of the relative cheapness of ferries, and thereby their mass use, see Bion J. Arnold, *Report on the Improvement and Development of the Transportation Facilities of San Francisco* (San Francisco, March, 1913).

3. Winston Weisman, "A New View of Skyscraper History," in *The Rise in American Architecture*, ed. Edgar Kaufman, Jr. (New York: Metropolitan Museum of Art and Praeger, 1970), p. 131.

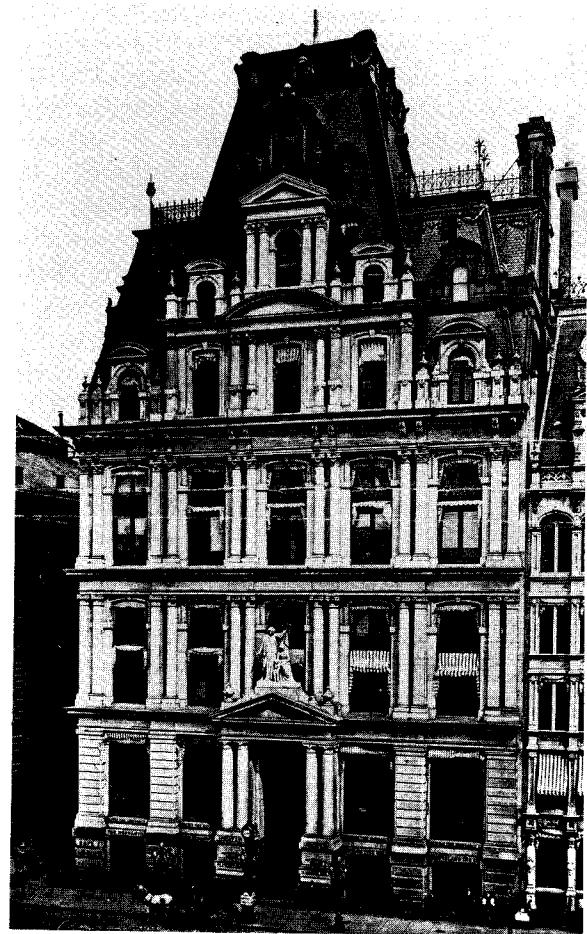
The Emergence of the Complex City

creation and certainly the *signum* of the modern city as yet to be adopted in Europe.

To make possible the architectural—as opposed to geographical—solution of the space problem in cities, the elevator was the key to open the first lock inherited from the past. In 1850 in New York a manufacturer, Henry Waterman, made the first use of an elevator, essentially the hoisting machine that dated back at least to the late-medieval cranes found in places handling heavy commodities such as the salt of Lüneburg and the cargoes of Antwerp. Waterman transformed these ancient lifting machines to provide vertical transportation between two floors of his factory by attaching a platform to the cables of the hoist. Quickly thereafter, in the hands of Elisha Graves Otis who had installed such a primitive lift in a bed factory where he was employed, improvements were worked out that made the elevator safe against cable failures. With that perfection the passenger elevator was available and several were installed in New York City buildings in the 1850s.⁴ In 1859 came the first installation in a hotel. It was of an awkward screw propulsion, rather than Otis's later cable-drawn improvement. The Haughwout Store—also in New York, built in 1857, and only five stories high—had a similar installation. From these beginnings the great utility of the elevator became evident, and rather quickly further adoptions were made in public buildings. Once the elevator had come into use, architects were emboldened to increase the height of buildings beyond the modular five stories that had come to be seen as the greatest height to which people would willingly climb on foot.

The urge to reach to higher levels, made possible by the elevator, came to be constrained by masonry construction. The problem was that weight-bearing walls had to be thickened to carry more stories, and that enlargement encroached upon the most valuable space in a building, the ground floor. This additional lock on expanding the size of building through increasing height was opened by the adoption of cage and curtain-wall construction. Again, the decade of the 1850s in America furnished the key. The earlier efforts were not aimed specifically at the construction of a truly tall building, but rather at the creation of a fire-resistant structure capable of supporting industrial activity. Such a structure was designed for Harper's, the publisher, in 1854 by James Bogardus, one of the earlier architects to use cast-iron components in construction. This Harper Brothers Building was only seven stories high, including the basement, but it was the first to employ wrought-iron beams—in place of wood, as in traditional building, or cast iron, which had been experimented with but not very successfully, because of its brittleness and poor resistance to fire. Wrought iron for use in tension, when combined with cast iron in compression, provided the first instance of successful all-iron construction. The Harper Brothers Building was not a full transformation of traditional construction; it used masonry exterior

4. John W. Oliver, *History of American Technology* (New York: Ronald Press, 1956), p. 404. In 1941 a U.S. Army bomber flew into the side of the Empire State Building in New York, severely damaging an elevator and causing the car, with its operator, to fall eighty stories. The operator was badly injured but not killed. In instances of equipment failure, rather than direct aerial attack, American safety elevators have proved most worthy of their name.



walls, but its interior structure of iron was far more fire-resistant than had previously been possible, and it proved to be much lighter than older construction.⁵ That lightness of dead load became a critical feature soon thereafter when iron construction was carried to its logical limit with the creation of the cast-iron façade and then of iron-post-borne party walls. The iron cage within the building joined to, and bracing, an iron post-and-infilling exterior finally created the condition whereby (1) the dead load weight of the building per story was considerably reduced over masonry construction, and (2) that weight could be concentrated on a set of columns opening up the sides of the building to better fenestration and the ground and lower floors for use without thick and continuous masonry walls. The iron-cage building became a reality with the Equitable Life Assurance Society (subsequently Equitable Insurance) Building in New York of 1868–70. Although only five stories high, that structure is considered by several students of the skyscraper to be

5. W. A. Starrett, *Skyscrapers, and the Men Who Build Them* (New York: Charles Scribner's Sons, 1928), pp. 20–22.

This is the Equitable Insurance Company Building, perhaps New York's first skyscraper, in 1875, after it had already had to be expanded from its original construction several years earlier. This was the first office building in the world to be equipped with an elevator.

the first one in existence because it had an iron-cage construction and the first elevator found in an office building. Thus, all the elements critical to the building of truly tall buildings were in place, to become the panacea for the experimentation that produced obvious skyscrapers in the early 1890s. Independent footing of the piers for the columns was devised in Chicago after the bad experience of the Federal Building there—finished in 1880, and placed on a “continuous foundation on soggy soil”—showed that deeper piles reaching to firm ground or bedrock were required to support the newly enlarged buildings. The increasing weight of additional stories was reduced when Balthasar Kreischer, a New York manufacturer of fire brick, found the solution of both dead load and fire protection in the hollow tile, which he patented in 1871. Finally, in 1884–85, the best material for constructing the cage, which supported the building and on which the walls were hung, was found in structural steel, first employed for that purpose in the ten-story Home Life Insurance Company Building in Chicago. With it the skyscraper became a reality in a form that has changed only in detail, not in fundamentals, for a full century. During that period in the Windy City the height has risen from little over a hundred feet to nearly fifteen hundred, but the engineering structure has remained fundamentally the same, with the main difference showing up in the severe problems of wind force encountered in constructing buildings more than a quarter of a mile high.

The architectural solution to the problem of packing more people into the heart of the city was thus in hand soon after 1850. A truth quickly assailed urban society, however, that the cost of such vertical accommodation was such that many activities and large components of society could not be cared for through tall buildings. Obviously, heavy industry could not be carried on in structures of considerable height. Similarly, the poorer classes, which had throughout history been sheltered for the smallest possible cost, could not be housed in expensive buildings. By the middle of the last century it was obvious that an architectural solution could not care for most of the exigent demands. Instead, those seeking to facilitate the increases in industry and trade, which supported the cities that came with the maturity of the American Republic, had to turn toward a geographical solution to the problem of the city's growing economy and population. And in Europe, where the American skyscraper was adopted only very slowly, virtually complete provision for growth had to be placed on the physical expansion of the metropolis. Only in the last generation has the tall building been further transformed, as we shall see in the next chapter, and with that change the architectural solution to the crowding problem has been reasserted.

The Geographical Solution to City Growth

The increase in the average height of buildings in the traditional core of metropolitan areas, which obviously added far more space than did the more exceptional skyscrapers found in only small numbers even in the largest cities, could care for only part of the spatial needs of the growing urban centers. Experience showed that five or six stories was the natural modular height of city buildings until automatic elevators and reinforced concrete

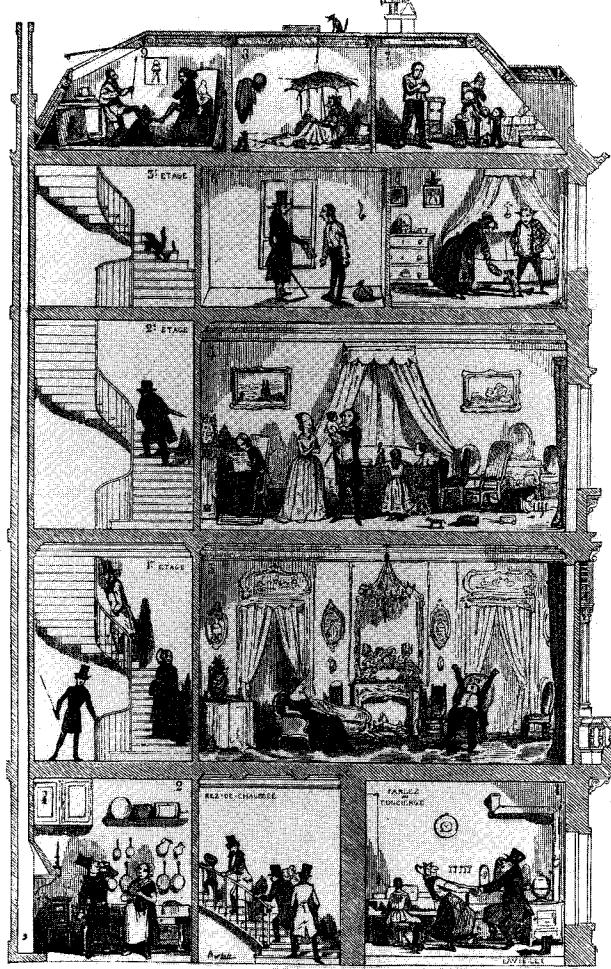
construction were introduced after World War I. Thus, the core area became more accommodating of growth, but not infinitely so. This was especially the case with respect to housing, which could not accept the costs of higher-building construction, and to industry, which needed the strength of low and spread-out structures. Starting in the 1840s, the railroad had encouraged the growth of industrial satellites—at waterpower sites in New England and in the environs of such traditional industrial towns as Birmingham and Manchester in England—and was beginning to permit the creation of bead-pattern suburbs at the stops along the rail lines adjacent to the larger cities. Those suburbs, however, could only be used by the upper classes in England, leaving the vast body of city people crowded in the traditional core of those cities. In the United States conditions were somewhat more democratic, both because of the cheaper cost of housing in suburbs and of railroad tickets, available in weekly, monthly, or even season versions, and because of the relatively higher wages of labor in the United States. Still, even here there were a great many city people who could not afford to live in a railroad suburb while remaining employed in the traditional core. Crowding of central housing increased as economic growth led to ever-expanding employment there.

The decades of the middle third of the last century witnessed a great growth in city population in the United States, but it was concentrated in the larger metropolises and in the hearts of those now giant places. Thus, the crowding problem was exaggerated by its concentration in a relatively small number of cities—Boston, New York, Brooklyn (then separate), Philadelphia, Baltimore, Pittsburgh, Cincinnati, Cleveland, Chicago, St. Louis, New Orleans, and San Francisco. Elsewhere, the American city was still of small enough size that the traditional urban fabric could provide adequate housing depending on rail transportation for long distances and walking and horse-drayage for local movement.

In the largest cities—New York, Brooklyn, Philadelphia, Chicago, and Boston—the longstanding morphological solutions were so hard-pressed by the final third of the last century that great efforts were made to shape a geographical expansion of the city to match the architectural one we have noted. This search came particularly in housing, where the need to secure reasonably priced incrementation was great. The physiological limit of five or six flights of stairs put a lid on housing expansion in the traditional city. In the years just after the Civil War the “elevator apartment house” was devised in New York, mainly for the wealthy who wished to ape the style of life of contemporary Paris, where large *appartements* were piled one on another rather like a stack of what the ancient Romans had called *domus*—that is, large and complete dwellings occupying one story (in ancient times, the ground floor) in a taller building housing other families. The elevator apartment had first appeared in New York City just after the Civil War when J. C. Cady designed the Aurelia and Richard Morris Hunt the Stuyvesant, the latter an “Apartment house complete with a *concierge* living on the ground floor.”⁶ These socially as well as structurally elevated buildings demon-

6. John Burchard and Albert Bush-Brown, *The Architecture of America: A Social and Cultural History* (Boston: Little, Brown, 1961), p. 112.

The five levels of Parisian life (by Edmond Texier in 1854) portray an interesting urban morphology. Before the introduction of elevators, the "French flat" had come into existence in Paris as the ancestor of modern apartments, but it was vertically stratified in such a way that social class declined sharply with increasing elevation—just the reverse of the situation when elevators were introduced into housing at the end of the century.



strated graphically how it was possible to pile people up in the city without reducing the space or amenities available to them. The price, however, was so great that this architectural remedy could serve the needs of only a small upper-income group.

The Railroad Suburb

The same was true, though not in quite so restrictive a fashion, of the earlier railroad suburbs. What was obviously needed was a form of transportation that could bring into the built-up city the wedges of undeveloped land lying between the several radiating railroad lines as well as that land that remained too far from their suburban stations to be used for development. With railroad suburbanization there remained much open land between the beads of growth at the outlying railroad stations. These two types of open land enclosed within the boundary of the railroad suburbs would furnish a sufficiently large increment to the area of the traditional city to allow a

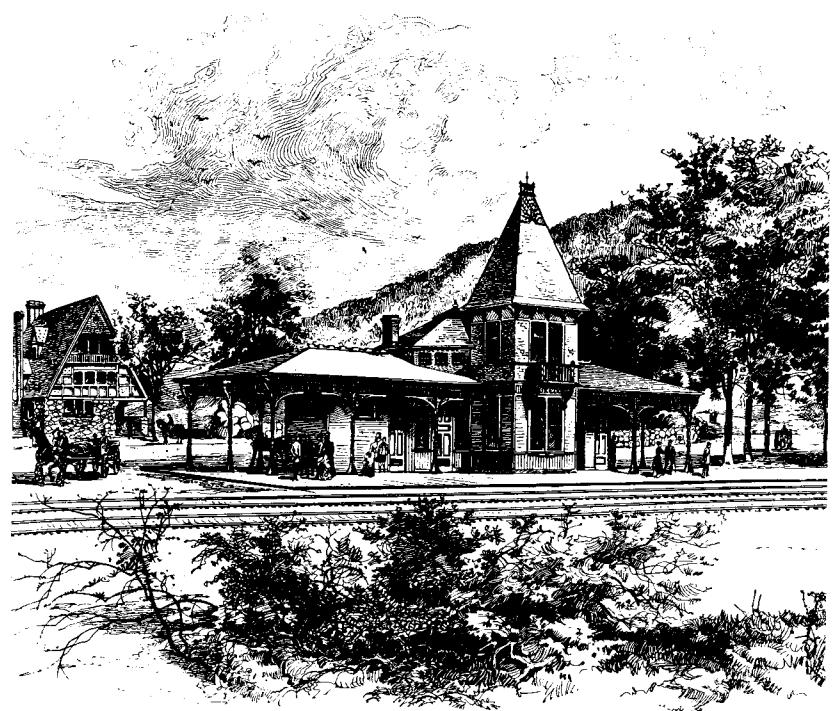
massive increase of modest and low building for housing, thus keeping the costs down. We should not forget that an area of a basically circular form increases geometrically with the simple arithmetical lengthening of the radius. The traditional city, which even in the larger places extended only two to three miles from the center, could gain a considerable enlargement of its built-up area through suburbanization without, initially, much increase in the radial journey from the city center, where most employment was to be found. Thus, a geographical solution to the crowding problem of the Industrial Age city through full use of all land within the outer radius of the railroad suburbs represented a powerful remedy, and one that could benefit the lower middle and blue-collar classes as well as the wealthy.

The latter point must be made because the early suburban dwellers tended to be the rich, who moved out of the early-nineteenth-century city as much for health reasons as for the aesthetics and social cachet of living beyond the city's edge. The causes of the frequently recurring epidemics in the cities of the last century were not fully understood, but observation had shown that there was less contagion in rural areas. Those who could afford to had already begun to send their families away from the coastal cities during the hot summer period, partly for the greater comfort in the countryside but also partly as a preventive measure against disease. It was a short step from this seasonal departure from the city common among the upper classes before the Civil War to the permanent movement of those classes to the outermost fringe of the metropolis. In this way there grew up in the United States a logical association of the edge of the city's residential fabric with the home of the socially elevated. Only where industrial satellites were in existence within the broad suburban band was this class association of the edge of the city interrupted.

Generational Shift in Suburban Residence

There were never so many truly wealthy families that a complete annular ring of their housing might surround a city. The result was a class-striping at the edge, with a few truly wealthy suburbs, usually located where the environmental amenities were perceived to be highest, interbanded by middle-class suburbs located either where transportation to the central city was superior in speed, or adjacent to industrial satellites where those of the middle class living in that band might find employment. The appeal of the true edge of the city seems consistently to have gripped the members of the upper classes. For that reason there was a generational shifting in the residence of the younger additions to the fortunate classes. The rich moved outward each generation, unless they had such an open suburbia that their estates permitted scions to build new residences on family lands. The middle class also followed the outward shift of the suburban frontier, introducing the process of handing down parents' properties to those a little less able to buy the desired spot. Sociologists have looked upon this process as one of "invasion and succession," but that term is commonly a poor description of what is going on. Except where there is extreme pressure induced by ethnic segregation erected in the face of a rapidly expanding ethnic population, the

Tuxedo Park, New York, was in a sense the epitome of the suburb—the blending of urbane living and semi-rural setting. But when it was established as an exurban park for the housing of the rich by Pierre Lorillard just after the Civil War, it was private, snobbish, and unproductive, best known as the birthplace of semi-formal menswear.



economically less favored population does not force itself upon the more fortunate. What happens is a generational shifting toward the periphery, which became the main social-geographical process in American cities in the first half of the last century: the children of middle-class or upper-class parents, who themselves join their natal class, generationally find new housing at the edge of the city. When their parents die, the children commonly find the environmental qualities of their own housing preferable to that of their parents, leading them to sell off the family house, normally to a person of a slightly lower economic class. This slippage in social class of the residents of an area comes normally from the fact that the chosen, the "in," place to live at a particular time is not where the parents resided but rather where the current upper middle class tends to live under a generational shift of residence.

This generational shift exists as well in European cities, though its operation is far less clear and observable. The narrow ownership of land, its treatment as the symbol of social distinction, and the much greater reliance on relatively immutable morphologies of housing—such as the *appartement* in France and elsewhere on the Continent and the row or terrace house in Britain—all slow down the handing down process. The massing of these patible ownerships into conjoined structures has tended to create vast areas of relatively consistent environment and architecture that do not change with the succession of generations. In America, where the detached single-family house is the module, changes in both environment and architecture can come more rapidly and effectively with each generation.

Generational shift and the handing down process have been the most widespread forces at work in the shaping of American cities. A major reason for this near ubiquity is to be found in the transportation underpinnings of these social and economic practices. The growth of suburbia, which is a critically necessary element in the working of generational shift, has entailed a dependence on transportation since early in the nineteenth century, when larger cities had grown too extensive to be reached in all parts by walking. Thus, disregarding in the modern context the small suburbs of medieval and early mercantile cities, we may make the basic point that the form, use, and location of a suburb tends to be conferred by (1) the common form of transportation at the time of its inception, (2) the age of the individual suburb, and (3) the changes in transportation that have come since the suburb's initial development.

With respect to the location of suburbs, there is an annular succession shaped by transportation. The very early suburbs of the Industrial Age city were few in number, small in size, and approached by the small groups that had access to carriages for moving around the city. In the second quarter of the last century, with the establishment of omnibuses, these germinal extensions of the traditional city expanded considerably, though still in a relative rather than a truly extensive sense. Now "villa areas" were developed, frequently in handed-down areas of suburban estates that were newly practicable for subdivision into generous lots for villas. In this context the truly rich could, because of their probably more leisured status, continue to move outward, bequeathing both their former estates and a remnant of their social

cachet to the upper-middle-class suburbanites who were constructing large, detached, but not land-surrounded houses in these new omnibus-served suburbs. Omnibus suburbs would, of necessity, cling to the edge of the traditional settlement, leaving the rich with their carriages as the only group that might wander farther afield from the traditional city.

It was the coming of the railroad that changed the situation wherein only the generally leisured could move any distance outward from the traditional city. The railroad was not initially constructed to aid suburbanization, but once in existence it served that purpose. It seems to have had its main influence on the housing of the solid middle class, those families in which the husband had the money to commute to the city from the suburbs, if mechanical transport were available. The result was that a bead pattern of suburbs grew up at a spacing of two to three miles along these rail lines, the operating characteristics of the locomotive determining the intervals. Because steam trains were relatively cheaper per passenger than omnibuses, certainly for the distances covered, the houses built in these bead-pattern suburbs were more numerous than in the earlier villa districts, though still quite substantial and of single-family occupancy. Lots tended to be fairly compact, perhaps eight to ten or twelve thousand square feet in area, because the composite journey-to-work involved walking to the suburban rail station from the houses clustered fairly efficiently around it. Once the limit to comfortable walking distance had been reached by residential construction, it was physiologically better to move to the next outward train stop than to walk an excessive distance within the slightly closer suburb. This sharp

constraint on the individual suburb size was one of the major forces in the continuing search for a more geographically comprehensive form of transportation to supplement the railroad.

The Rise of the Horsecar

Not only the gaps in the bead-pattern housing structure but also the increasingly wide open sectors between the radiating rail lines encouraged that search. A still different force urging on the efforts at the geographical improvement of rail transport came from the concentration of rail service largely on radial movement to and from the city. The main interconnection among railroads came at or near the center of the city, so the various sectors reached by rail could be interconnected only near the core. Circumferential transport—that from one outlying area to another located on a different vector—was poorly served by rail. Not only was there the desire for improved public transport leading to the central city from within the sectors between rail lines, but also there was the need to create some form of circumferential service that could interrelate the several radial lines without recourse to the crowded junctions near the core of the metropolis. Thus, what was sought was the creation of a more comprehensive and ramified network. The steam railroad did not furnish such a network as it then operated any more than it does today.

The search for a more fine-meshed public transport in the suburban band was less intense than the effort to find transport with a higher density of service within the traditional city. Omnibuses had begun the introduction of true public transport in the central city just after 1825, but their high operating costs had limited the size of the group that might use them. The contemporaneous development of the steam railroad as a mechanized form of transport for long-distance movement suggested an obvious way to bring to the city a form of transportation that could carry far more people, and thereby make possible increasingly economical working. Efforts were made to introduce trains to street running, but the results were highly unsatisfactory. The mass of the steam train was such that it could not be stopped quickly, making it dangerous to operate amid pedestrians and horse-drawn vehicles. In addition, trains were slow to accelerate and their locomotives tended to spew sparks on those nearby. By the early 1830s the street-running experiments were seen as a frontier expedient not acceptable within a major metropolis.

The heart of Boston could be reached by rail because large tidal flats surrounded the city's small peninsula and became the site for railroad embankments separated from the city's street net. But in New York the solution was particularly difficult. At the time the only practicable access to Manhattan Island was from the north, with a crossing of the narrow Harlem River and a line carried down the long north-south axis of the island. City growth had come in that same axial alignment, so the edge of the built-up city was particularly far removed from the business core south of Wall Street. The railroad promoters would have built southward to that colonial limit of

the city, but the municipal government would not have it. Twenty-third Street was as far as they would countenance steam's running: south thereof any trains would have to be horse-drawn. The promoters did not face this constraint for the first five years of the railroad's existence, as horse traction was used throughout the line's entire length until 1837. At that time the railroad extended from Prince Street to Harlem, but steam working stopped at 14th Street, with horse traction employed south thereof. This "street railway," commonly considered the world's oldest, is thus rather ambiguous as a model for latter constructions. It was intended as a true railroad, to use steam, but for its first five years the narrow geographical scope—the charter limited construction to Manhattan Island—encouraged horse working. Only when steam was belatedly introduced was a functional division of the New York and Harlem River Railroad struck. With the adoption of steam, a station was established on Fourth Avenue between 26th and 27th streets, with the line thence to the heart of the city being worked by horses, confirming the status of this section (26th Street to Prince Street) as that pioneering horsecar line. But steam traction always disturbed the Common Council and mayor of New York. In 1844 they forbade steam operation south of 32d Street, and in 1858 south of 42d Street. That latter action finally led the New York and Harlem Railroad—as its name was by then spelled—and its tenant, the New York and New Haven, to adopt 42d Street as the terminal for standard railroad operation when Commodore Vanderbilt's merger of the Harlem, Hudson River, and New York Central lines created the need for a new station in New York. Opened in 1871, Grand Central Depot at 42d Street stood for forty years as New York's main and only important station.⁷

The early development of the street railway in New York City suggested the practicability of the medium—it was adopted for use in a somewhat analogous situation in New Orleans within two years—but there was then nearly a twenty-year gap before the horse-railway systems became common in the United States. It was only in the 1850s that most of the larger cities adopted street railways: Brooklyn at the beginning of the decade, Paris in 1853, Boston in 1855, and most other large cities by the outbreak of the Civil War. These operations had been encouraged by the New York demonstration that street railways were practicable, though they were delayed in installation while a distinctive horsecar technology came to be worked out. The wheelbase of the cars was shortened, permitting the rounding of tighter curves, something also facilitated by the adoption of a narrower gauge than the railroad's standard. Lighter cars with a more restricted loading gauge not only made street running more practicable but single-horse traction more effective. Thus, it was only about 1850 that the true street-railway era begins, again supporting the notion that it was only during a fairly short period at midcentury that the rapid transformation of the city to a modern form was accomplished.

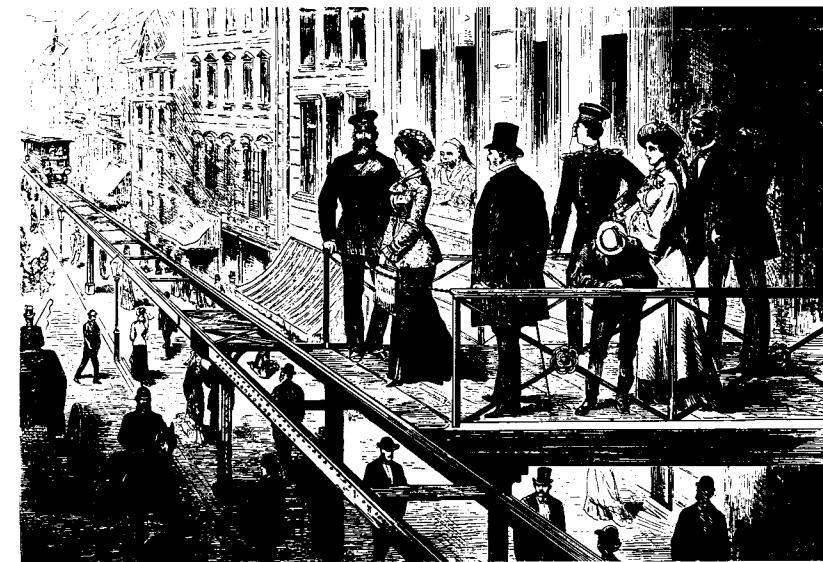
7. William D. Middleton, *Grand Central, the World's Greatest Railway Terminal* (San Marino, Calif.: Golden West, 1977), pp. 11–25.

The Streetcar Revolution

The street railway had an impact on urban morphology not previously witnessed in such a short period. The walking city had, save in a small number of giant—and awkward—cities, been a place whose radial extent from the center of the town was seldom more than a mile. With the advent of the horsecar lines the outward limit could be, and was, pushed up to about two and a half miles, thereby vastly increasing the area of the city from little more than three square miles to just under twenty. This rapid areal expansion became an omen for street-railway cities; and compact growth could be maintained because the horsecar lines were so easily ramified, wherever the street for development was at hand, that a circular and fully developed city resulted. For a generation this vast land incrementation permitted the housing of a working-class population, at a generally reasonable cost—more so in America than in Britain because lines were much more common and extensive in American cities, and because wages were that critical bit higher here to permit more democratic use of street railways. On the Continent, particularly in France where the street railway came to be called *le chemin de fer Américain*, greater use than in Britain was made of this mode of transport, probably in some measure because continental city housing was in tall structures of small tenements and *appartements*, which created a very compact built-up area even in a city as large as Paris. Thus, a place was created that was practicable for horsecar service without the undue ramification of lines that made operation expensive. In contrast, American cities with large amounts of single-family housing developed at such a relatively low density that the practicable outer limit of horse traction was being reached and strained within the generation that followed the Civil War, and before the giant population growth that came with massive European immigration had fully begun.

It was in this immigrant-crowded metropolis that the next innovation in intra-urban transportation was sought, again most earnestly and effectively in the eastern part of North America. Before we look at that development, recognition should be made that the Germans were carrying out similar experiments with electricity and the French—given their cardinal role in the evolution of chemistry—with compressed air and the use of gaseous reactions. But it was the American-Canadian solution that was truly successful, becoming the model the rest of the world adopted in short order during the final decade of the last century.

Steam had not proved a satisfactory motive power for urban use. Nevertheless, efforts had been made to adopt steam traction, accepting the fact that it could not effectively intermesh with street traffic. The solution, obviously a compromise, came through the separation of the steam-drawn lines from the streets, with those public systems carried either in tunnels below ground level or on tracks elevated above the street. In London in 1863 the first subterranean line was opened as the Metropolitan Railway extending from Paddington Station in the northwest to Farringdon Street at the edge of the City. This was a costly project whose extension was further limited by London's general lack of straight and wide streets in which a trench could be



The elevated railway in Berlin in the 1880s was a way of providing electric traction in public transportation, but hardly for the masses.

cut and subsequently be roofed over to allow street traffic to return. Only slowly and at great expense was the Metropolitan Railway extended into a circular line that eventually interconnected most of the railroad stations located on the north bank of the Thames. Even at this slow pace, none of the “cut-and-cover” underground lines passed through the true heart—either shopping or financial—of London. In New York in the late 1860s almost the obverse solution to the problem of using steam in the city was sought. There, the elevated railway was experimented with and lines were developed northward on Broadway. In due course in the 1870s and 1880s elevated lines were rapidly extended toward the north end of the island, and as well within the shopping, if not the financial, district. There were numerous environmental objections to these steam-drawn elevated trains, but the speed with which their routes might be expanded and their greater proximity to the office and shopping objectives of most intra-urban travelers overcame objections to their construction. But the underground and the elevated were big-city projects, too costly to be used in smaller places. It was in the eastern part of North America, where there were a number of medium-size cities, that the search for a solution was continued.

That solution became fairly apparent in the 1870s when the work of Edison in the United States and the Siemens brothers in Germany made electrical generation and transmission practical. In 1879 Germany held an Industrial Exposition in Berlin for which Werner Siemens developed and installed an electric railway of a rather primitive sort. He followed up on this with short electric lines in Germany and Northern Ireland built during the early 1880s. The scientific and engineering communities were very much aware of the potential for electric traction; what remained to be done was to work out the system of transmission from the generating station to the motors in the car. When tried out on the streets of Berlin, Siemens's system of third-

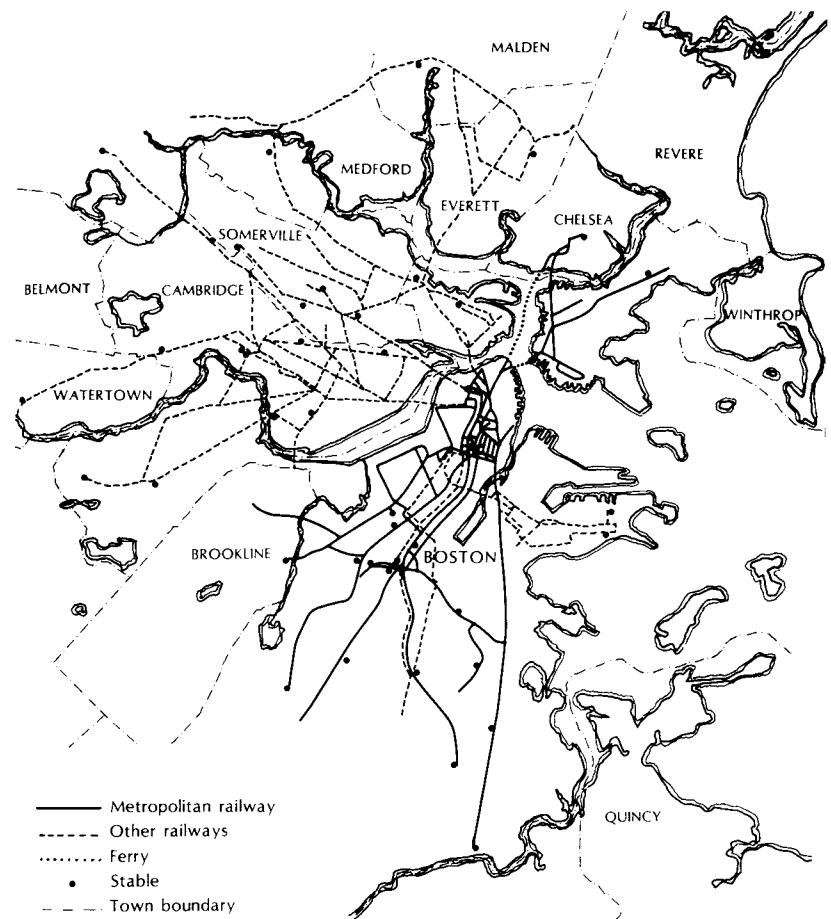
rail operation was found dangerous from the shocks it administered to horses making a misstep. This third-rail system could function reasonably well when employed on a separate right-of-way, as it was at Licherfelde and at the Giant's Causeway in Ireland; but it was not the solution to street running in cities.

Edison was also interested in this problem, but at the same time he was wrapped up in the experiments that would lead to the invention of the phonograph. It fell to the lot of one of his assistants, Frank Sprague, to pursue the matter of electric traction for street railways to a successful conclusion. Sprague, originally a graduate of Annapolis interested in electricity, resigned from the Navy to work at Menlo Park with Edison but soon found that the electric locomotive project captured so little of the great inventor's interest that he left to found his own company to engage more actively in the experimentation. In this work he was far from alone. Edward Bentley and Walter Knight had electrified part of the East Cleveland Street Railway in 1884 through the use of a third rail carried below street level in a conduit rather like a cable-car cable. In the mid-1880s Leo Daft, who had installed a third-rail line in Baltimore and in East Orange, New Jersey, had also experimented with two overhead wires to create the electrical circuit. In 1886 Charles Van Depoele gained the right to electrify the Capital Street Railway in Montgomery, Alabama, thereby earning the honor of having created the first fully electrified system in the United States. From a historical vantage point, however, we now realize that each of these systems had serious technological failings that would have made wide adoption unlikely. It remained for Sprague to put all the necessary pieces together successfully and to shape the installation in Richmond, Virginia, that opened in the spring of 1888 to become the model quickly adopted not only in North America but worldwide.

What Frank Sprague accomplished was to devise a system of electric supply that was cheap, easily extended, and highly successful. This was distribution on a single overhead wire, using the track as a return "ground," from which power was taken by a spring-controlled, underrunning trolley pole. In addition, he developed an excellent traction motor, ingeniously held in geared contact with the actual car axles by a wheelbarrow mount that compensated for poor and rough track. Finally, Sprague contrived a simple and effective controller that easily handled the problem of increasing and decreasing the flow of electricity to the motors, regulating the speed of the car. It was found that the traction motors might be used as brakes, greatly facilitating the rapid stopping of the car. This early work also brought out the superior qualities of the electric traction motor in gaining rapid acceleration. With fast stopping and starting, a much reduced mass compared with the steam trains, an efficient and cheap supply of power, and an already developed right-of-way furnished on streets, either by existing street railways or by new construction for which no more than a franchise to occupy part of the street area was needed, the electric traction system became the first truly effective instrument of the geographical expansion of cities. Thus, the year 1888 represents a great turning point in the matter of urban morphogenesis.

Richmond was hardly large or important enough at this time for its

The Continuing City



activities to transform urbanization so radically. But Boston was, and it was Henry Whitney, president of the world's largest and most successful horsecar company, the West End Street Railway of Boston, who began the change. Whitney had been interested in the Richmond electrical experiment by one of his associates. Soon after the line was opened under electric traction, Whitney went to the former Confederate capital and Sprague conducted an experiment for him—when in the middle of the night he put all the Union Railway Company's cars on the line and managed to start them one after the other in close file (by dint of firing the boilers to the maximum at the generating station and putting as much current in the line as could be secured from his generators). This convinced the Bostonians that their much more densely used lines could be operated employing the Sprague system, which they immediately ordered to be done. Thus, Boston was the first large metropolitan city to adopt what had come to be known as the trolley, gaining its name from the original overrunning electric pickup, which seemed to be trolled along the two wires then employed.

The horsecar lines brought together as the Metropolitan Railway in Boston in the mid-1880s created the world's largest horsecar system and the first major installation of Frank Sprague's trolley system.

The Emergence of the Complex City

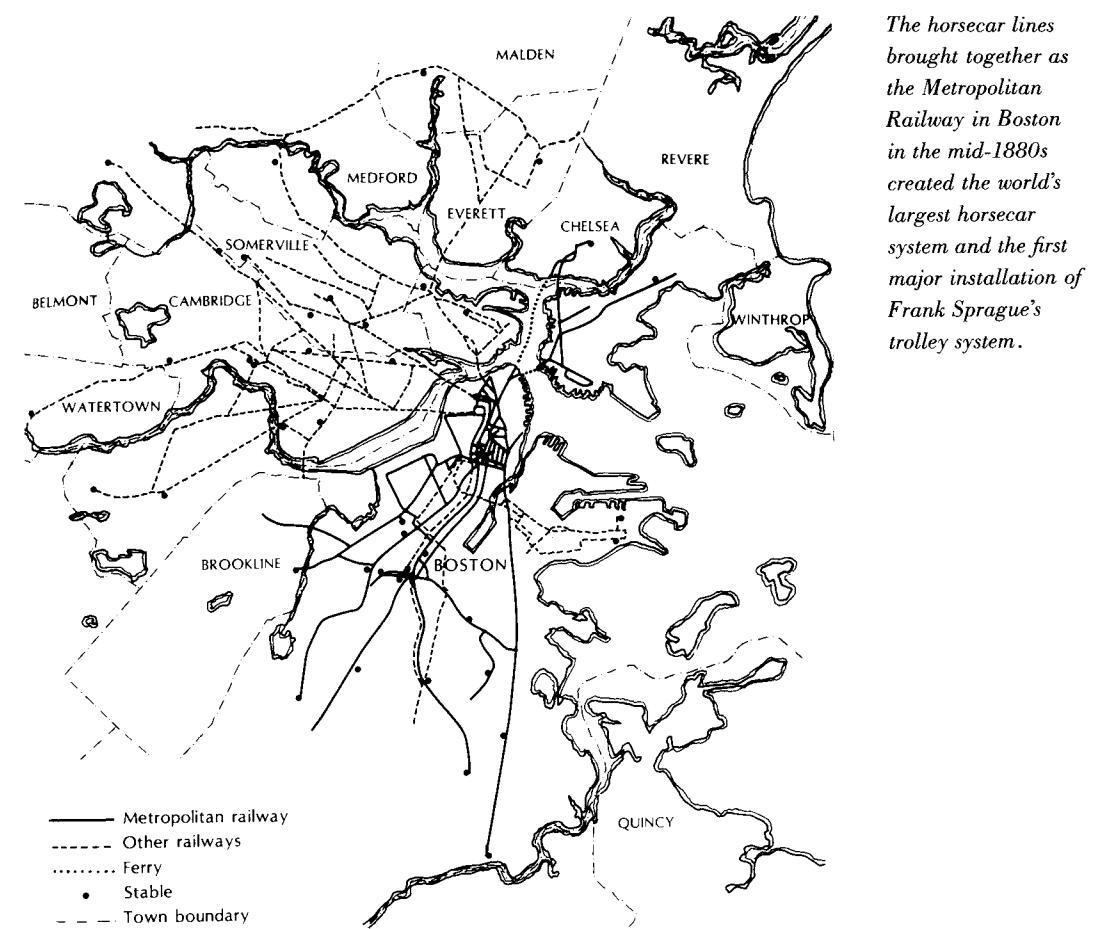
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The Emergence of the Complex City

Boston: The Laboratory for Electric Traction

In the period of fifteen years after Henry Whitney's decision to electrify the West End Street Railway, Boston probably did more to evolve electric traction than any other city. This was the case not merely technically but economically as well. I believe this important role grew out of Boston's very early adoption of the geographical solution to urban crowding, allowing us to look upon the Hub as the laboratory of the suburb as much as of the electric railway. Boston had stood as the world's first railroad hub, having the service of three radiating railroads before London had any mainline connection and before Paris had any rail service at all—the first was in 1837 to Saint-Germain, followed by Right- and Left-Bank lines to Versailles in 1839 and 1840. That Bostonian railroad provision combined with the distinctive political structure of New England—with established and geographically defined rural towns—to encourage the creation of perhaps the earliest bead-pattern suburbs to be developed. Ultimately, Paris gained a fringe of such places, high in social status, with a concentration toward the northwest in the direction of Versailles where the earliest rail lines had been constructed by the Rothschilds and the Periere brothers, but Boston had such suburbs both earlier in time and more broadly occupied in class terms.

By midcentury there was active commuting from blue-collar as well as middle-class suburbs into Boston, creating the practice of suburbanization on a relatively greater scale than in perhaps any other large city. During the last 150 years Boston has normally been the American city where the suburbs bulked relatively largest in numbers of people and importance. It was in Boston's first suburb, Brookline, that the great apostles of suburbanization—H. H. Richardson, who found the first widely adopted architectural idiom for the suburb, and Frederick Law Olmsted, who developed the first conscious morphology for suburban layout—lived and worked. We should appreciate that America made two fundamental contributions to world urbanization in the last century, the skyscraper and the suburb; it was in New York and Chicago that the architectural model for coping with urban growth was shaped, but in Boston that the urban-morphological contribution was worked out to a mature form.

In the late 1880s, when the West End Street Railway was being electrified, that system stood as the leading horsecar line in America, the largest street railway system in the world, and the only example of a unified system serving an entire large city. The west of Boston was well developed in the suburbs of Brookline and Newton. The first was so close to Boston, though socially, politically, and culturally distinct from the city, that the horsecar lines could provide it with intra-urban service. Newton lay too far away for horse traction, so the Boston and Albany Railroad took up the burden of tying the numerous suburban "villages" that grew up there to the center of employment in the Hub, through the construction of its Highland Branch wandering through the two premier Boston suburbs, dotting them with stations designed by Richardson or his disciples, and bordered by parks and estates from the drawing board of Olmsted or his pupils. But all of this transportation was radial from downtown Boston, leaving movement within

the suburban band in an awkward state. The safety bicycle, introduced in the mid-1880s, helped along those lines, but the electric cars held out hope for a more effective and universal solution. It proved much easier to create suburban networks of trolley lines in those places where the railroads could, at best, provide only a multiplication of radial lines, as in the Highland Branch. This was particularly important to women seeking to move about the suburbs rather than to commute to the city, as did their husbands. In addition, what we would today call the service trades found the trolley service valuable in getting about the suburbs. And as the suburban band expanded, it engulfed some older industrial satellites, creating therein the desire on the part of the more prosperous workers to move out of the mill towns toward a new working-class suburbanization that might be facilitated once networks of suburban trolley lines, particularly those circumferential to the traditional city, could be opened.

The history of the West End Street Railway greatly encouraged the early adoption of electric traction. Boston had begun developing horsecar lines in the 1850s and during the next thirty years had created a number of different companies normally serving separate sectors outward from the downtown. By 1885 these had been merged into four major companies. That same year a Boston shipowner, Henry Whitney, whom we have already met, decided to engage in a large suburban development in Brookline adjacent to Boston where he and his investment group bought some five million square feet of land. They hired Frederick Law Olmsted to lay out a new, landscaped and divided boulevard along Beacon Street, only to realize that to develop this land successfully they needed not merely a horsecar line but an electric operation, because the distance from the city core was too great for effective horse traction. The resulting West End Railway could not easily undertake electrification, because the company's access to the downtown had been granted by the state legislature over the tracks of other companies, which had no interest in facilitating their competitor's business by agreeing to his mechanization schemes. It became evident to the Whitney group—which, interestingly, included Albert Pope, America's premier bicycle builder, who fully understood the need for transport in the suburbs—that the only way to get the mechanized line to downtown Boston was by merger with one or several of the existing horsecar companies. "In early 1887 Whitney and his associates began to purchase the stock of the established lines, and by June Whitney had control of all four. . . . Rationalization began almost immediately. With more than 3,700 employees, 1,700 cars, 8,400 horses, and 200 miles of track, the West End was a gargantuan outfit for its day." In organizing this massive company Whitney pioneered the corporate structure that was later to be adopted by most of the larger city transit systems. "Fares were standardized and some free transfer points established. At Whitney's urging, the West End abolished zone fares and established a uniform nickel charge for any ride *regardless of length*. The flat fare provided a simple method for handling a high volume of traffic moving in diverse directions. It was also a definite saving to long distance passengers at the expense of short haul travelers. Additional conveniences awaited mechanization. Crosstown lines and a universal transfer system only became feasible when a new

motive power made longer routes possible."⁸ The earnest nature of Whitney's visit to Sprague's Richmond installation is easily understood in this context.

The West End decided to undertake an experimental electrification on the Sprague system of a stretch of its track. Proving highly successful, in contrast to the essential failure of another experimental stretch using the Bentley-Knight system of electric conduits, Sprague's overhead trolley wire was adopted for all lines, and all were to be electrified. Passenger totals increased 59 percent to 137 million in 1894; crosstown lines became common, thereby facilitating the movement about the city without recourse to downtown junctions; and the lines were ramified to virtually all parts of the metropolitan area by 1895.⁹ Still, the trolley network of Boston, the most extensive in the world, extended only some five miles from the heart of the city. Anyone wishing to commute a greater distance could do so in a practical way by turning to suburban train services. Even so, the lengthening of the lines and their ramification, when joined to a very rapid growth of suburban housing, had so built up traffic that the heart of the city was becoming "blockaded" by trolley cars.

The Geographical Impact of the Nickel Fare

Before we look at the solution to that problem, we should note the impact of Whitney's decision to adopt a flat nickel fare. This was done because the operating superintendents were convinced that it would be cheaper to operate the electric cars that were being substituted for horse traction. These cars were considerably larger than the horsecars they replaced, were capable of continuous operation over very long days—horses could work for only a few hours each day, requiring time-consuming replacement—and could be run closer together on the track. The West End Street Railway reasoned that there would be such an increase in traffic that more was to be earned by encouraging a mass transport than an expensive but rather exclusive one. All of this because of the considerable initial costs of electrification of the lines, which in Boston ultimately averaged about \$86,000 per mile.¹⁰ With such investments to amortize, it seemed essential to develop a large clientele for the trolleys.

The geographical impact of the flat nickel fare was dramatic. For the first time a form of transportation came into existence that reduced the economic cost of distance, if not its time demands. Once one had boarded the trolley, it cost no more to ride to the end of the line, even using transfers to other lines, than it did to go only to the next stop. The relatively low cost of electric-car travel, added to this geographical comprehensiveness, meant that most elements of the working population could envisage using the trolley in a journey-to-work. Once that assumption was made, the location of worker

housing was freed from what had been a longstanding constraint. Fatigue was considerably overcome in the journeying to and from work and the continuing extension of the electric lines allowed an ever-increasing area to be brought within the potential residential area of a major urban labor-shed. In effectively doubling the radius of commuting, from two and a half miles to five miles, the area open to housing was raised geometrically. Because Boston shared with Chicago a true port site, with only around half the circle of environs lying on land, the outward spread was unusually lengthy for the population growth. Still, the geometrical increase in the suburban area with lengthening of the radial journey was such that enough land could be added to the suburbs to assure plentiful land for development. This supply kept the prices down, making suburban lots much cheaper than those near the core and encouraging workers to move outward in their search for relief from the core-area crowding problem. As long as the extended journey toward the edge of the metropolis cost no more in money, there seemed a great economic advantage to the lower-income groups to move out of the central city. If the housing they secured there were no larger than they had had in the center, then it would be cheaper. And if as dear, it was likely to be considerably more roomy. By the time of the trolley it was becoming clear to urban Americans that open, green, less dense housing areas tended to be more healthful. Although seldom formally propounded, this idea was widely held and encouraged a general, democratic suburbanization of American cities. The low and flat fares of American trolley systems, in which practice Boston was merely the pioneer, made American suburbanization a quite different thing from that of European cities, where only the rather well-to-do managed to move into suburbs.

By the time the trolley systems were fully developed, just before World War I, North American metropolitan regions had vast areas of blue-collar suburbs. The traditional city was considerably drained of its working-class residents, reducing the pressure for residence and permitting a more efficient reassignment of core-area land to nonresidential purposes. The suburban train and trolley services still focused strongly on the downtown of cities, most particularly in Boston, though the electric cars tended to have, in addition, lesser foci at outlying road junctions where radial and circumferential (crosstown) routes came together and interchanged passengers. For the first time there might be a number of transportation nuclei in metropolitan areas, rather than the single original nucleus at the heart of the traditional city. For several generations the suburban journey had been a rather simple one, from the port, industries, counting houses, and shops of the old core to and from the new housing areas. But with the trolley and its subsidiary junctions, much more varied and complex journeys outside the core became possible. For the first time it was practicable to move from one suburb to another, without entering the downtown, or to commute to and from the outlying industrial satellites that had frequently become embedded within the rapidly expanding suburban belt. In this way the satellites could expand their industrial production, through hiring additional workers, without having to create an enlargement of the mill towns that had earlier had to be set up as a support for satellitic development.

8. Charles W. Cheape, *Moving the Masses: Urban Public Transit in New York, Boston, and Philadelphia, 1880–1912* (Cambridge, Mass.: Harvard University Press, 1980), pp. 118–19. Emphasis supplied.

9. *Ibid.*, p. 120.

10. *Ibid.*

Morphological Changes Brought by the Trolley

A number of industrial satellites expanded in the Boston area. Waltham, the true hearth of integrated manufacture in the world as well as in America, grew industrially in the late nineteenth century by becoming a significant outlying trolley hub. The same was true of Framingham, Quincy, and Lynn. These towns lay far enough from Boston to have good steam railroad service, but until trolleys provided a large labor-shed of workers they could not easily grow industrially. Eastern Massachusetts demonstrated more graphically than anywhere else how the trolley could provide labor and working-class housing to support large industrial towns. Brockton, Salem, Lowell, Lawrence, North Andover, Haverhill, and Newburyport grew to become major American manufacturing cities in the trolley era. Not much farther from Boston, and still very much supported by a trolley network, were New Bedford and Fall River, the latter at this time the world's largest cotton textile factory town. By the time of World War I eastern Massachusetts had the greatest density of trolley lines of any region in America, considerably the result there of an intimate, widespread interaction of the trolley and the factory. Only in southern Belgium did Europe have a similar trolley-industrial landscape. But the early adoption in Massachusetts of the low, flat fare was the premier example of freeing distance of an "economic cost" and its impact on the lives of the blue-collar class.

The signal success of the trolleys in stimulating suburban growth, while still tying the suburbs mainly to the employment and shopping facilities of the traditional core city, worked somewhat ironically to bring about a great transformation of the traditional city's morphology. Discussion of that striking change must wait for a more general analysis of urban morphology. Here, however, in the specific context of Boston we must acknowledge some of that evolution. The trolley lines were intended to be a dense and diverse network within the closely built-up city and its suburbs. To accomplish such a service pattern, junctions became frequent and the more encompassing of these became potential sites for shopping in a wider context than the small bead-pattern suburb that had come earlier.

Such junctions in Brookline, Newton, Waltham, and other close-in towns and cities of the suburban-satellite band became important sub-metropolitan shopping centers with quite large stores, even some small department stores. The trolley made conflux on these outlying town centers possible. Even more, it opened all parts of the suburban-satellite band to transit to downtown Boston at all times of day and at a low cost. Much as the metropolitan area was becoming more complex and not so exclusively core-centered, the easing and cheapening of access to downtown Boston for women living in the suburbs encouraged the growth of shopping in the Hub. We now know that the trolley era (1890–1940) was the time of downtown supremacy in shopping of a specialized, infrequent-demand sort. Food and common, frequently sought goods might be bought in the suburbs, but large, distinct, special items would come from the heart of the metropolis. The trolley made that domination possible.

Because of the often quite specialized nature of those demands, shops

selling those particular goods had to stand in the center with its easiest overall access to the total metropolitan population. In geographical terms this meant that the central business district had to develop the most encompassing and efficient network of transportation ties. Further, it meant that the shopping core, to provide the specialization of goods impossible elsewhere in the metropolitan area, had to have the best of the best. This showed up in an important separation of core-area functions that began with the advent of electric traction, though suggestions of the split can be seen earlier in the time of the horsecar lines. This was the division between the strongly office-oriented functions of the downtown and those of the shopping sort. In Boston the two developed through a separation that left them neighbors: State Street became the core of the office-financial district, Washington Street that of the department stores and their handmaids. Partly because the offices had drawn workers into commuting travel before the department store had developed enough to woo the wives of the office workers to customary shopping in the central city—that is, because offices came before the advent of the trolley, whereas department stores were mainly contemporaneous with electric traction—the traction lines tended to focus on the shopping district and to burgeon with the development of the central shopping district. This co-evolution of the shopping district and electric traction perhaps began in Boston, the city that practically invented the American department store, giving its name to half a hundred such institutions spread from the shores of Massachusetts Bay to San Francisco Bay, and certainly introduced the trolley to America and the rest of the world's big cities.

The Boston Subway

In Boston the trolleys converged on Washington Street, the colonial "high street" and thereby a narrow, winding thoroughfare, and subsequently on Tremont Street, the next street to the northwest. These two streets became increasingly clogged with "sparkers," to the point that by the early 1890s they were almost impossible for other wheeled vehicles to use and certainly difficult for pedestrians to cross. Further expansion of the suburban street railways was stymied by this clogging of the center. The Bostonians themselves began to look upon this as the "barrier or blockade" problem, for transverse movement was becoming very difficult. Some measure of the rapid increase in riders with the advent of trolleys is given by the fact that Boston's per capita ridership of streetcar lines (horse traction) was 118 in 1880 and 175 in 1890, when electric lines were fast replacing the horse.¹¹ Between the year of the adoption of electric traction by the West End and the turn of the century, the outer edge of the contiguously built-up city expanded from four to ten miles. The growth was so rapid that traffic shot up a quarter in the four years after Whitney's decision to electrify.¹²

Bostonians came to the same conclusion as had Londoners and New

11. *Ibid.*, p. 125.

12. *Ibid.*

Starting from what was the largest horsecar system in existence, Boston was the first major city to create an integrated trolley system. That system focused on Tremont Street at the edge of Boston Common to such a degree that the "blockage" of "sparkers" forced the construction of a tunnel railway by the late 1890s.



Yorkers in the 1860s, that the only way to solve this blockage problem was to rise above it or burrow under it. The West End had proposed building a subway through the heart of downtown Boston in 1887, but a decision made that year to consolidate all street railway companies and one made the next year to electrify them put off the actual crisis for several years. In 1891 a joint state-city commission was established, including among its five members John F. Kennedy's grandfather, then a Democratic congressman from Boston, and Henry Lee Higginson, the staunchest of Brahmins and the founder of the Boston Symphony Orchestra. Congressman Fitzgerald was greatly taken by Berlin's Stadtbahn, an elevated line, and he led a faction opposed to subways as unpleasant and unhealthful in an era of widespread pulmonary disease. The 1892 report of the Rapid Transit Commission continued this interest in solving the blockage problem, but it was rather equivocal, favoring a solution to the transit problem by such things as consolidating the city's railroad terminals into two union stations, but not coming down strongly in favor of a specific plan to remove the trolley blockages. In the aftermath of this inconclusive document, the West End and others proposed building an elevated line or, failing that, a trolley line across Boston Common to keep down the costs. The outcry of Proper Boston was uncharacteristically shrill, even engaging the stern attention of Julia Ward Howe, whose *Battle Hymn of the Republic* seems all the credentials she needed as a defender of patriotic ideals.

A clogged and crowded Boston had to do something, so the city stepped in and undertook to build a subway that would be observant of the local pieties yet progressive in its unclenching of the stranglehold that the West End company's successful electrification had set upon the heart of the city. Perhaps the most geographical aspect of the problem was that the traditional

The Continuing City

394

city wanted the subway while the emerging suburban band, partly within the municipal limits but increasingly extending outside them, wanted more urgently some increase in the speed of travel to and from that to-be-improved core. The rapid outward extension of the closely built city—from a radial width of some two and a half miles to more than five miles—accomplished during the first few years of trolley operation had begun to make commuting from the suburban area of most active residential incrementation progressively more time-consuming. The economic cost of the journey-to-work may have been constrained by a commutation of daily fares to weekly and even monthly charges and by a single flat fare, but the time taken each morning and evening was not equally reduced. In Boston the outer suburbanites gained an ally in Captain Joe Vincent Meigs, the inventor of a rather unusual tubular steam-powered monorail—an experimental section of which had been erected in East Cambridge—who had initially sought to promote this system in particular; when the system ultimately showed technical problems, he pushed for elevated lines in general. Boston, the largest example of a medieval organic town on North American shores, was notably unsuited to elevated railway construction within the heart of its traditional city core. It was that fact perhaps above all others that determined that it should have the New World's first subway line. But even when agreement was reached on the necessity to burrow under the heart of the city rather than steaming above it on a viaduct, the problem of speeding up service to the suburbs remained. Thus, in the Hub we may observe the first effective solution to these two problems within what was to become the standard technology of a modern metropolis, the use of electric traction. London had a considerably older subway, thirty years before Boston; New York had an older elevated line, again thirty years before the Yankee metropolis. But these were steam-operated lines when Boston was examining the general subject of rapid transit. Odd bits of experimentation elsewhere had employed electric traction: the City and South London Railway opened in London in 1890 had used electric traction, but in such a mean and eccentric fashion that no one ever followed its lead; Liverpool had electrified a short but very specialized stretch of dockside elevated line in 1873; and Glasgow had opened a subway in 1896 but operated it with cable traction until the 1930s. But for a complexity of reasons it was in Boston around the turn of the century that what came to be the standard technology of urban electric railways was worked out in practice.

There is little doubt that Boston's pioneering role in subway and rapid transit technology was due to the fact that the city was the first large place to set about electrifying its street railways. With electric traction in hand, the problems that had beset such tunneling elsewhere were considerably reduced. The steam and smoke that continued to make a ride on the Metropolitan Railway in London a trial could be avoided, while the overhead wires made the development of a street-running electric feeder system practicable. There might be aesthetic objections to trolley wires, but there were few of those that were practical considerations as well. Thus, it was easy to carry the trolleys underground, tying together the best solution yet found for urban mass transit (electric traction) with what had to be the future solution to

The Emergence of the Complex City

395

funneling the greatly increasing numbers of passengers to and through the downtown areas (subway construction). This first "Boston solution" was soon enlarged, again in Boston as we shall see, and has been joked about for generations by New Yorkers amazed by trolleys underground. Only in our day, and mainly in Europe, has the trolley tunnel come again into its own as the latest in planning techniques.

The Tremont Street Subway, as it was called when it opened for service in 1897, was the fourth line to follow on London's example of the 1860s, but definitely the first of wider significance. We have already noted the short and idiosyncratic line of the City and South London Railway. And Glasgow's subway, completed just before Boston's, was a single ring, entirely underground—without even surface connection save by elevator—and was operated by cables until the 1930s. Even older was the short stretch of cut-and-cover subway completed in Budapest for the 1896 Hungarian Millennial Exposition. This line led to the fair site through a real estate development associated with the exposition. When that fair concluded, the Andrassy Street Subway remained to connect this bourgeois area with the heart of Budapest's business district, though it was never expanded beyond a couple of stops at its outer end, and its small original cars remained in use until the 1960s. Thus, Boston's was the first electric subway that was expanded using its original technology.

Construction on the Tremont Street Subway began in 1895. The project called for access to the tunnel, as it was first termed, at three points, two in the south and one in the north, where ramps would lead from the surface down to the subway, carrying trolley cars underground. Up to 285 of these cars could be handled in an hour without crowding, because most of the route had four tracks, one of the first instances of multiple trackage underground. The total length of the tunnel was two and two-thirds miles reaching from Haymarket Square, adjacent to the railroad station in the north, to Shawmut Avenue in the south and Boylston Street at the Public Garden in the southwest. The utilization of the subway was much advanced through the adoption of multiple-unit operation, under which several cars could be joined and run as a unit by a single motorman, allowing more cars per hour to move safely through the tunnel. This device had been developed by Frank Sprague for the South Side Railway in Chicago (an elevated) and was installed there earlier in 1897. This "M-U" operation became the basis for heavy rapid transit, because it for the first time permitted the running of trains on these urban lines that were equivalent in passenger capacity to those on the steam lines.

The opening of the Tremont Street Tunnel in September 1897 immediately relieved the blockages on that route and on Washington Street, which paralleled it through the downtown. The speed-up of access to the suburbs, however, remained a problem in the general context of introducing cheap mass transit to metropolitan areas. Chicago and New York had made an expedient solution to that problem by constructing elevated railways through the city center and outward to the fairly distant suburbs. These had originally been steam-drawn and only at the time of Boston's experiments in the late 1890s did Chicago seek to electrify its El lines. New York waited a few

more years before doing so. But Boston could not envision taking an El line across the downtown, so it was there that the experiments that finally demonstrated the greatest practicable technology were carried out and resolved. With the Tremont Street Tunnel open, the Meigs group of elevated-railway promoters pushed for the construction of elevated lines intended to connect through the city core via the newly finished tunnel. To accomplish that goal, the Meigs group gained control of the West End company and merged it into a new corporation, the Boston Elevated Railway. Then the subway was reequipped to handle heavy rapid-transit cars of the sort created for Chicago's electrified Els. Because there were four tracks, it proved possible to run both trolleys and rapid-transit cars through the tunnel, though using separate platforms, low-level for the trolleys mounted by steps and high-level for rapid transit entered directly at platform level. The arrangement, however, greatly reduced trolley capacity, so there was strong pressure brought to bear by the city to construct a separate heavy-traction subway parallel to Tremont Street, as was done on adjacent Washington Street. This was the first example of what has become the standard technology for very large cities, worked out tentatively in 1901 when the Boston El trains first used the Tremont Street Tunnel, and fully developed when construction of the Washington Street and Dorchester-Cambridge lines was commenced soon thereafter. As if these experiments were not enough for one metropolis, Boston also pioneered a subaqueous tunnel, at first carrying trolley cars, to connect under the harbor to East Boston. This line, which opened in 1904, was soon to be repeatedly copied by New York in gaining the interconnection of the five boroughs that had been joined into one city in 1899.

The development of the multiple-unit heavy rapid-transit car carried in a subway at the heart of the city, usually fairly coterminous with the extent of the traditional city, and on an elevated structure outside that core, became the turn-of-the-century state of the art for metropolitan transit. New York used the split in level between Manhattan and the outlying boroughs, even elevating the lines in northern Manhattan. Hamburg followed this American metropolitan practice directly. Philadelphia, slow in adopting rapid transit, did carry its generally elevated line through the center, under Market Street, when service began in 1908, though there was little expansion of the system for a generation. Chicago, a leader in El development, stuck to that form until it opened its first central-city subway in 1943, to be doubled by a parallel line in 1951. No doubt part of the delay came from that city's low-lying site and severe storm drainage problems. By the time of World War I there had been general acceptance of the three principles that Boston had established in 1901: (1) transit in a metropolitan city must conform basically to the existing arterial-street pattern and be electrified, (2) the system must be carried underground through the traditional core because of the crowded nature of that area and its largely prevehicular street net, and (3) high-speed rapid-transit lines outside the traditional core would be provided through elevated or surface rights-of-way that reduced the capital cost of the system to a manageable level.

This brief look at Boston's transit evolution is intended to bring out the forces shaping the ultimate design and broad historical timing of its individ-

In Chicago the focusing of intra-urban transportation on the downtown was so extreme that an elevated line around the core, the Loop (shown here on Wabash Street), had to be constructed. Note the electric streetcar line on the street under the elevated. Photo: Chicago Elevated Railway.



ual stages. Because Boston was the American, and in some instances the world, pioneer in those technical adoptions, this examination provides us with the most succinct picture to be had of that technological evolution. What we must now add are the basic changes in urban morphology that stemmed, at least in part, from this evolution of urban transportation, changes that, along with the characteristic urban transit at the outbreak of World War I, largely remain with us even today. There has been great incrementation to this modular pattern, but it has come primarily at the edge of the 1914 metropolis and supplemental to its standard of transportation. Obviously, in cities of less than a million people, rapid transit normally was not developed; the urban area was seldom extensive enough to provide the requisite market or, for that matter, the absolute need for such considerable private investments, as they first were. In those medium-size cities only the first of the Bostonian principles applied, that the street railways would be fully electrified. In all likelihood, as in most rapid-transit systems, there would be the adoption of Boston's economic practice of the flat fare, traditionally a nickel, so in all levels of urban places up to and including the giant metropolis, the "economic cost" of intra-urban travel was unitized, and at a low level, at the same time that this complex electric traction was being devised.

Urban Morphogenesis in the Electric-Car Era

We are immediately confronted by two aspects of urban morphogenesis that we must distinguish. The first is the re-ordering of space within the traditional city and the second is the elaboration of spatial patterns in the

suburban-satellitic band. Up to this point we have been concerned largely with the role of electrified transit in facilitating the journey-to-work, and thereby encouraging the suburbanization of metropolitan residence. This undoubtedly was the most radical transformation that the trolley era brought, but we should appreciate that moving one function away from the traditional core tends to free central space for other activities to begin there, or at least to provide space for the expansion of land uses already found there. Initiation of new activities or expansion of existing activities will lead to a fundamental transformation of a morphologically established area. In terms of the great mid-nineteenth-century problem of crowding in traditional cities, electric traction created a great geographical solution. Particularly the democratization of the suburban shift through electrification and the nickel flat fare opened large areas previously required for housing to other and more economically productive uses. Retail and wholesale commerce and industry might spread within the core, not only because housing pressure was reduced there but as well because workers might now be recruited from the much wider labor-shed of the metropolis as a whole. In commerce, there was a great lift to retail trade due to enlarging metropolitan population tied by a dense electric-traction system focusing on the city center. The cheap fares, the frequent trolleys even during the day, and the greatly ramified street-railway system all served to encourage suburban women to begin shopping downtown, or to make far more frequent journeys to those precincts. The massive scalar rise in transit passengers between 1890 and World War I confirms this, as well, of course, as the massive growth in the size and number of downtown department stores catering to that trade. Even wholesale commerce was aided in a general way by electric traction, through a greater ease in securing qualified workers, the creation of an intensive network of mechanized transport in the core city, and even the use of trolleys for the distribution of the package freight so much the outflow of a wholesaling operation within a large metropolitan area. We shall take up these specific land uses and their transformation in the time of the trolley, starting as seems logical with the evolution of the location, scale, and function of retail trade during this period.

The Transformation of Retailing

It is difficult for us today to appreciate how recently the conditions of medieval trade were transformed into what we all accept as modern practice. In 1850 that transition was only beginning, but it began to pick up speed in the period between the Civil War and World War I. In 1850 the provision of goods to purchasers still partook heavily of the medieval practice of artisanal production—the geographically dispersed handmaking of goods, often only in response to orders previously placed by the purchaser. Because any artisan could produce only a small volume of goods during a year, it is clear that geographical dispersal of the workplace by such handworkers was possible, and probably desirable for their support. They might easily dominate a market, admittedly a quite small one, if the purchaser had to count on several visits to the workshop to secure the finished good.

Contributing to this parochialization of production was the simple absence of standards of size, construction, and taste in many goods. Before the Civil War there was no statistical information on the size distribution of the population, men or women. Any making of clothing for general use tended to produce only ill-fitting garments rejected by the fastidious in favor of tailor-made garments, which required the geographical proximity of the artisan and the customer. The Civil War did change things somewhat for men, because that conflict produced the first mass conscription, the first giant armies, and, for clothing those men, the first extensive anthropometry (obviously only of men). From those measurements, and based on the needle trades brought into being after 1861, ready-made men's clothing became practical and reasonably successful. Even such standards, of course, did not totally suffice, and in recent decades an extension of mensuration has come in "big and tall" clothing for men, though oddly not "small and short" clothing, as does exist for women. Women's clothing had to wait until the close of the period under discussion before ready-made garments were widely accepted. How the standard measurements were arrived at has always seemed a mystery, there never having been conscription of women until the establishment of the Israeli state in 1948.

It is only in our time that modularity and standard sizing have been established. Differences among the products of individual manufacturers were common, even in the items produced by a single worker over time. The semicircular roofing tile was traditionally produced by slapping clay on a worker's thigh—thus making the desired taper—but one can easily envision that the tiles shaped by youths, workers in their prime, and old men would be different products. In historical geography it is possible to regionalize many things, particularly building materials, clothing materials, food, and drink, the most important of consumption items. Raw materials were normally of local provenance, so considerable variation among goods could take place. As long as human society was guided by local practice rather than "style," the geographical dispersal of production was protected by local taste. But with migration, internal and overseas, taste tended to become interwoven and thus lost to a style one gained more commonly from a distance. To facilitate such external provision of goods, which was likely to follow on outside shaping of taste, standardization of size for particular items seems to have been important. It is hard to sort out, but the geographical extent and anthropometric diversity of the New Lands may account for the fact that in the United States men's shirts may be bought in different sleeve lengths, though that is impossible in Britain (as is finding a narrow shoe there).

As with most human actions, there was a circularity to this matter of standardization. Having established some general agreement on taste and sizing, centralized shopping might become common. And once common, then its style would tend to dominate, reinforcing the appeal of the center against the artisan production and sale in the small town. It was for these reasons that the central shopping district gained ascendancy during the fifty-year period between America's earliest large-scale wars. That growth of centralized shopping before the late 1880s put increasing pressure on the

horse-drawn street railways, and after that time caused electric traction to be introduced and initially well rewarded. It is hard to imagine the central business district in its halcyon days without the contemporaneous development of the trolley, and then of rapid transit. This association of shopping with transit development is well demonstrated by the impact of rapid transit on cities. Boston's Tremont Street and Washington Street subways fixed the heart of the shopping district, concentrating the location of department stores in a fairly tight clustering at the intersection of the two true rapid-transit lines at Washington and Summer-Winter streets. This process Walter Firey observed a generation ago in Boston, and we may see it at work in other large cities.¹³ Although he did not make a specific point of the matter, we should add to his analysis of the location of the central retail district the progressive nature of this concentration with the adoption of heavy rapid transit. In the horsecar and trolley eras, downtown Boston had gained a unique status within metropolitan retailing, but it was with the building of the subways and their outward extension along separate rights-of-way—or even more elevated lines—that the central intersections of the system gained their most dominant position. The earlier railroad stations had not so concentrated the location of the general-merchandise (department store and variety store) shopping. It waited on the arrival of the subway.

Why did the rapid-transit development lead to a concentration of the city's general merchandise retailing? The answer lies, I believe, in the difference between steam-train commuting and rapid-transit travel. Even when Firey was writing in 1947, the rapid-transit system extended only about seven miles from the major intersections at Park Street and Washington and Summer-Winter streets. Subsequent extensions have considerably increased that distance, but in a time when downtown shopping has radically declined. It seems fair to say that during the palmy days of the central retail district the rapid-transit train moving over a fairly short distance was the greatest force in concentrating retailing. The horsecar radius was something around two and a half miles; the trolley probably doubled that distance. Rapid transit did not so much extend it, only a couple of miles in Boston's case, but it so speeded up movement over those seven miles that further incrementation to the tributary area of central business districts came from adding on trolley and bus connections made at the outer termini of the rapid-transit lines. The entrance figures for the Boston Elevated Railway in 1943, quoted by Firey, bear out this conclusion. The busiest subway-elevated entrances were four in the downtown shopping district and four termini of the radiating rapid-transit lines. Obviously, there had to be a great conflux of surface-transit passengers on those termini to raise their receipts as high as or higher than those of the downtown destinations.¹⁴

The cheapness and ubiquity of mass transit in the heart of the metropolis—the seven-mile radius of the rapid-transit lines plus an outward connection by trolley and bus that is harder to determine, though it probably added

13. Walter Firey, *Land Use in Central Boston* (Cambridge, Mass.: Harvard University Press, 1947), pp. 229–61.

14. Ibid., p. 237.

little more than another five or six miles—made it the nearly universal means of access to the shopping district in the center. In the case of Boston, only those suburbs lying more than twelve miles or so from the core area probably depended mainly on steam-train service for downtown shopping trips by public transit. Within the metropolitan area, the 1920s witnessed a small but in the long term significant variation in this vastly normative pattern of public-transit access to the central business district. That change came in the emergence of an income-class divide in the form of transportation used in the journey-to-shop, with some incrementation by occupation. The upper middle and upper classes by this time had seen the rapid rise of women drivers, because many families owned two cars and even in one-car families the husband often commuted to work by train from the outer suburbs, leaving the car at home for the wife's use. As we shall see, this rise in cars available for the wife's use during the day began the growth of suburban town-center shopping for other than the most basic necessities, when a few of the more socially distinguished towns began to house shops of a sufficient style to encourage women to think it safe, in terms of taste, to shop there away from the established arbitration of taste to be expected in the downtown stores. In the 1920s, once driving came in these outlying clothing-store clusters, it appears that women became emboldened to drive to the edge of the central city and there carry on a somewhat more specialized purchasing of clothing and household items. In the case of Boston, this led to the creation of the Back Bay shopping area clustering around the Ritz-Carlton Hotel and along Newbury Street. Other cities had a similar outlying but still core-city high-priced specialty shopping area, such as that near Forest Park in St. Louis, on the Near Northside in Chicago, and on Wilshire Boulevard in Los Angeles.

There was as well a more democratic development of shopping peripheral to the downtown but still well within the core of the metropolis. Sears, Roebuck and Company led the way in this development by constructing its special form of the department store clearly at the distant edge of the downtown where free parking could be provided. The rationale for this location was expressed as a response to two aspects of specialized shopping: that Sears was in a real sense a "man's department store," and that by the late 1920s most men had access to a car if they wished to use it for shopping. The success of these large but clearly branch department stores at the edge of the downtown, which were opened in the 1930s for the most part, was such that other firms gained the confidence to follow in similar locations. The range of stores was, however, still somewhat limited, restricted mainly to household goods (furniture, linoleum, rugs, paint), automotive needs (new and used cars, parts, painting), building supplies, and other types of selling that could benefit from large and fairly cheap space, free adjacent parking, and automotive transport by the customer of the purchased goods. Let it be emphasized at this point that these edge-of-the-downtown shopping areas were an extension of that metropolitan-core retailing area, not a true outlying shopping center, which we shall consider in due course. What these peripheral shopping areas represented was an automobile extension of the central business district, as well as an increase in locational specialization within the core-area retailing structure.

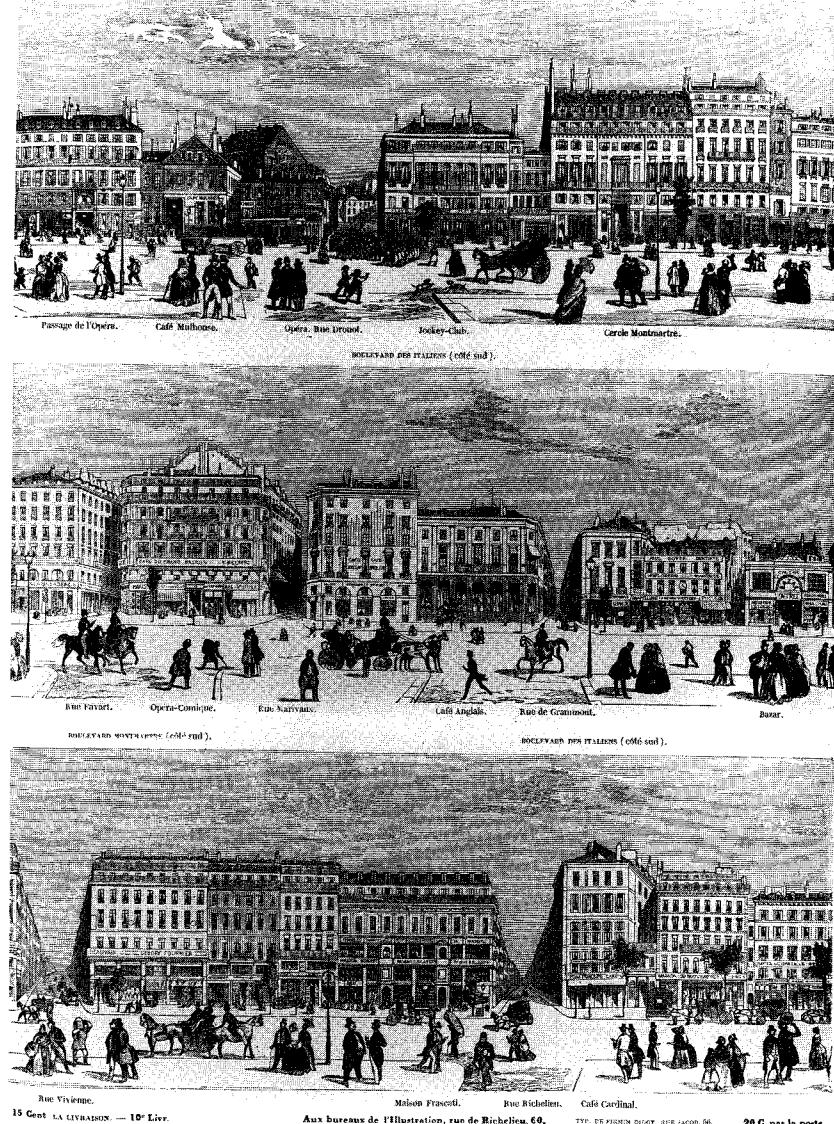
Re-Sorting of Functions at the Center

Inside the central business district the advent of the trolley, and even more of rapid transit, had begun this re-sorting and real extension of functions. More shoppers could reach the downtown at a reasonable price in money and time, and with the fall in artisan production and its replacement by factory production of the same basic items, the central business district gained additional trade. This growth came from the simple fact that under artisan production the pay of the artisan is normally joint, part coming from the manufacturing act and part from that of selling. Under retailing divorced from manufacture, the profit must come entirely from the selling operation. To reach an acceptable entrepreneurial profit, the scale of sales must be enlarged to make up for the full cost of the return for manufacture, and probably as well for the introduction of "new" costs of shipment from a greater distance and more critical reliance on wholesaling. It seems likely that in the period around the Civil War, and possibly for several decades thereafter, manufacturing did not totally depart from major metropolitan regions. What had been produced by artisans now was likely to be produced by small manufacturing plants dispersed among a nation's major metropolitan areas. We appreciate this geographical pattern in the early years of the automobile industry—with its factory-based but not greatly agglomerated production. As time has passed there have been mergers, and failures, in most industries that have led to an increasing geographical concentration of manufacture. That spatial contraction obviously has forced the transportation and wholesaling of goods that were previously locally made and available to retailers directly from the plant, rather than through an intermediate wholesaler's warehouse.

Thus, the scale of selling had to increase first with the artisan-factory shift and subsequently with the local-national plant shift. To encompass these new costs, which might be considerably counteracted by the economies of scale in factory and then giant plant concentration, stores that might tap an entire metropolitan market had to be developed. To accomplish that business goal, there was essentially only one geographical location that might be adopted under train and electric-traction transport: at the convergence of all lines of those forms of transport within a metropolis, in the central business district. As long as mass transport was public transport, there was no alternative to locating many kinds of retailing—those requiring metropolitan-wide markets—at the core of the traditional city in the central business district.

Within that district the specialization of products sold in particular shops was reflected in an internal geography of retailing. Before the middle of the last century, even the larger cities of the United States, mainly the ports established by European settlers in the sixteenth and seventeenth centuries, were characterized by what we might think of as commodity-combining shops commonly operated as a joint wholesale-retail establishment. These were frequently the businesses of merchants whose interests included commerce as well as shipping. Ships were financed, sent to distant destinations, there to trade in local goods that were distributed in trade by the merchant on the ship's return to home port. Thus, the selection of goods

This drawing of Parisian streets, Boulevard des Italiens and Boulevard Montmartre, shows the rapid increase in the size of retail shops following the introduction of the world's first department store there in 1852.



the merchant might be handling at any one time was likely to be determined more by where the ships had been, what items they had secured at a good price, and when they returned to home port than by established demands of the local populace. Advertisements in early newspapers confirm this pattern of trade and make clear that only by combining both wholesaling and retailing and various commodities was mercantile activity profitable in the first half of the last century.

The geography of this early retail trade reflected its strong tie to shipping and wholesaling. Shops were normally located on streets leading up from the wharves on which these foreign goods were landed. Even when the American Industrial Revolution began early in the last century, it seems to have been common practice for manufacture to be tied to the colonial ports, in being

The Continuing City

undertaken as near to those places as waterpower was available and, perhaps more important, in being financed by the mercantile capital that had begun to accumulate in the larger ports. The tie also took the form of having selling agents, commonly drawn from the same merchant group that provided the capital, owned and dispatched ships, and traded in a diversity of goods, designated to handle the entire product of the new American factories. The tie between Samuel Slater's textile mill and the Almy, Brown, and Tiffany merchant families in Providence is well known, as is the role of the "Boston Associates" of former China traders and shipowners in the shaping of the great textile towns such as Lowell, Manchester, Chicopee, and Holyoke. The counting houses of these merchants-turned-manufacturers at first clung to the docks, bringing the retail trade there in what might be seen as a dependent location.

As the provision of goods from the United States began to overtake and surpass that from outside the country, the wharf-head location became decreasingly functional, particularly after the mid 1830s when the railroad and the American factory, in harness, oriented the receipt of goods in the city to a different site, the environs of the railroad station where freight cars could be spotted on side tracks for unloading into wagons for transport to nearby wholesale-retail establishments. These "team tracks" (referring to the tractive force used) became a magnet around which the filings of retailing and wholesaling were attracted. Still, the link of the two forms of trade tended to be maintained because manufacturers commonly had agents established in the nearby city to handle the sale of their goods on a wider scale, and they might engage in some local retailing of those products. And in more distant cities an intermediary wholesaler might equally undertake retailing within his local market while serving as distributor in bulk to a much wider area. The firm of Field and Leiter in Chicago was just such a business, one wherein the split between wholesaling and retailing was to take place only late in the last century when the name Marshall Field took on totally retail connotations.

Once rail transport of goods became the dominant means of getting products to market, the geography of retailing in American cities came to reflect the point of connection of that urban place to the emerging railnet of America rather than to the docks of colonial times. In Boston, for example, the shops moved toward the northern rail terminals (of the Fitchburg, Eastern, and Boston and Maine railroads ultimately joined in a Northern Union Station just beyond Haymarket Square) and toward the southern rail terminals (of the Boston and Albany, New Haven, and Old Colony railroads later brought together in a Southern Union Station). The wharf-head site tended thus to be abandoned by retailers and to be taken over by more clearly mercantile-financial establishments. As State Street, this abandoned wharf-head site became Boston's financial district, a district that played perhaps the dominant role in the financing of railroads in the United States and one nearly as significant in the shaping of American industry. But the shoppers went elsewhere, particularly to the streets leading toward the southern station. Parenthetically, we might note here that this siting of retail shops seems to have become permanent, because once the trolley and rapid-transit devel-

opments began, they were constructed to the shops, rather than the other way around.

The New York Example: Rule by Rapid Transit

In New York a very different history was experienced. The original merchant shipowners and wholesaler-retailers were located adjacent to the docks, particularly those on the lower East River. This siting became extremely eccentric, as residential growth had to take place in a narrow vector northward from the Battery, causing the large retailers to move away from the port but not truly toward the railroad, as in Boston and many other cities. Admittedly, the railroad was closer to the retailing district that grew up on Lower Broadway than it had been to the wharf-head site where retailing began in New York. But the late arrival of the railroad in New York and its untypical form with horse-traction on its southern extensions made the geography of commerce there unusual. The elevated lines of the 1870s were built in considerable measure to make the far-downtown location of retail shops economically viable. But as a test of the strength of the general principle that the dominant retailing district would grow up near the railroads, the opening of two new rail connections to Manhattan with the construction of Pennsylvania Station and its tunnel connections both to New Jersey and to the Long Island suburbs put in service in 1910 worked a major translocation of Manhattan retailing, drawing department stores northward from Lower Broadway and Eighth Street to the vicinity of Penn Station at Herald Square (34th Street).

We may then take as a general geographical principle that by the middle of the last century, when railroads were coming to most American cities—though Boston had had them fifteen years before and thereby had begun its shift of shops in response to the station magnetism somewhat earlier—the main source of goods for a city's shops was rail. As long as the linking of wholesaling and retailing persisted, the source of goods probably played the dominant role in determining the siting of the commercial establishment; but once that tie began to weaken, retailing might potentially respond to different locational forces. Thus, we must first look at the divorce between the two scales of commerce. It is impossible to do so in detail here, so I shall attempt to summarize more extensive conclusions on this split that I have presented elsewhere.¹⁵

Retailing seems to have hugged wholesaling in location as long as the inconstant supply of goods and the problematic quality of the local market made attaining an acceptable level of entrepreneurial profit from retailing alone a matter of doubt. Merchants with the desire to see their business grow were likely to find the geographical flexibility of wholesaling, with its ability to summon orders from afar without the same necessity to force customers to gravitate to their doors, appealing as the way to gain that growth. While cities, even the oldest of them found in the colonial ports, were relatively

15. James E. Vance, Jr., *The Merchant's World: The Geography of Wholesaling* (Englewood Cliffs, N.J.: Prentice-Hall, 1970).

small and movement from even the near countryside to them was infrequent and often difficult, wholesaling would have seemed the dynamic partner in this commercial embrace. With the growth of cities during the first two-thirds of the last century—due to industrialization and the enlargement of transport and mercantile functions to support that activity—local markets were greatly enhanced. New York had become a city of a million people, and other ports had grown in kind, while inland industrial cities such as Pittsburgh, Cincinnati, and Cleveland were expanding rapidly. More and more cities seemed to be reaching a population where a specialization in retailing became feasible economically. This shift was further encouraged by the industrialization of the society itself. The number of people, even the percentage of the population engaged in nonfarming pursuits, was growing with sufficient rapidity that many of the household sources of goods characteristic of an earlier America were disappearing. Those living in tenements could not normally grow their own food or make their own textiles. They might still make much of their clothing, but they could not spin and weave the cloth for it. Furniture, pots and pans, and many things that might have been home-fashioned in the eighteenth century were now purchased. Another important change had come in the matter of supply. With domestic American manufacture now tied to urban markets by reliable train transport and the electric telegraph, in place of overseas sources that were months away by sailing vessel in an era when there was no electrical communication, the supply of goods could now be nearly continuous, certainly rapidly replenished in case of unusual demand. All these conditions quite simply made the embrace of the two components of commerce less essential. A retailer might logically expect to gain a reasonable entrepreneurial profit. Similarly, the wholesaler with the enlarged market, the access to telegraphic communication, and the reliance on domestic rail transport rather than sailing vessels to distant shores could expect to gain by putting a more concentrated effort into the distribution of goods to a large number of retailers located in an array of small towns.

Divorce of Retailing from Wholesaling

The divorce of retailing from wholesaling was normally amicable, with in many cases an agreed on sharing of the capital but a subsequent concentration of attention in two different lines of trade. The retailer gained one very considerable advantage: he could tap a greater variety of wholesalers and thereby gain a diversity of goods, which might be expected to enlarge his trade. From this elaboration of lines was likely to come a larger total of business and quite probably some increase in the intensity of the use of the space he occupied. Translated into geographical terms, this meant that the retailer seeking to expand his trade became increasingly dependent on the conflux of customers. In the coupling with wholesaling, access to customers was not so vitally important, though still desirable. Wholesale trade has always depended, obviously, on mass sales. Even in the era when country merchants had to go to the city to select the goods they would buy in moderate volume, they tended to visit established connections, because of

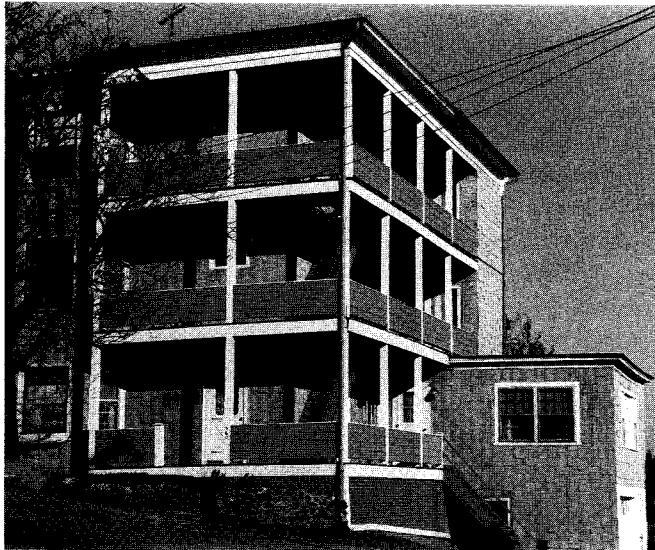
the credit relationships that commonly existed. Having gone to the city on a major, normally infrequent, search for goods, the country retailer could be expected to go wherever in these still modest cities his wholesale connection was located. This greater spatial flexibility of the wholesaler with respect to customers was counteracted by the extreme dependence of those same merchants on finding a location that was favored by rail connections to distant suppliers of their goods. We shall in due course take up the location of wholesaling, so it is sufficient for now to emphasize the point that the desirable location for wholesaling and that for retailing began to diverge sometime around the Civil War, leaving the retailers to experiment with new locations and to turn to dependences other than the steam railroads that so strongly determined the location of wholesalers' warehouses.

How did the retailers move in this context? To answer, we must begin by noting that it was the easy access to a large and probably inconstant body of small purchasers that now mattered. Even ties of loyalty that might be created by long association and the extension of charge privileges could not supply the constant need for replacement brought on by the mortality of established local retail customers, in contrast to the frequent corporate immortality of wholesale customers. Survival depended on easy access, growth on easier connection, and domination on easiest conflux. In these terms the retailer came to see location as of the greatest importance to business success, and thus a charge to be accepted willingly. Soon after the Civil War it became obvious that retailers were willing to pay the highest land rents of any occupier of land, in either absolute or relative terms. Per square foot of land, per foot of sidewalk frontage, and per square yard of building space, the retailer became dominant, with the most successful retailers the kings of the land-rent mountain. In that situation it was the locational judgments of the leading retailers that gave shape to the land use of the heart of the traditional city.

Going back for just a moment, we should fix in mind that the siting of the city, its point of settlement initiation and thereby the historical heart of the traditional city, was determined by external conditions, by its ties to a wide trading system that was planting a trading entrepôt on distant shores. As the city grew, the wholesaling part of commerce generally continued this exogenous dependence, with its elevation of the use value of sites in the heart of the traditional city. But for retailing the dependence was geographically different: it was internal to the city and its possible metropolitan extension. Few places received many retail customers from afar, and even those that did, such as New York, St. Louis, New Orleans, and San Francisco, still received such a small proportion of retail customers from external origins that the shopping district was located not in response to this minor component but in reflection of the geographical origin of the great mass needed to make a retail business successful—that is, the metropolis itself. This transformed geography of the retail component of commerce induced a fundamental shift in the downtown business district, causing it to expand in volume of business space used in commerce and in area of land taken up by trade. As we shall see, there was with morphogenesis an architectural-geographical split of the sort we have noted in the solution to the general

The Continuing City

408



As cities became more crowded, means had to be found to house people at greater densities. In eastern New England the three-decker was introduced to permit three house-size flats on the same foundation. Pictured is a Gardner, Massachusetts, house.

crowding problem in cities. To architecture and landscape architecture fell the lot of providing new building forms and spaces to care for this transformation, while to geography came the responsibility for finding the large functional areas needed to permit the metropolis to evolve. The split between wholesaling and retailing was only one of three such sunderings placing greatly increased spatial demands on cities. Industry was increasingly being separated in space from the housing of its workers, and the central city was becoming ever-larger as a workplace while relatively smaller as a place of residence. In all these cases, it was proving that the divorced functions took far more space once split than they had immediately before while coupled.

These splits afforded to each form of land use what seemed to be appropriate economic solutions to growth. Retailers, as kings of the land-rent gradient, had the most money to spend per unit area, permitting them to preempt land in or near the core that had previously been in other uses, particularly those of residence. It appears that in most cities the retail district experienced its incrementation on its boundary with housing, though there were much less common experiences of growth of shopping facilities into industrial areas. There might be residuals of retailing still within the quarter it had previously shared with wholesaling, but these were remnants of the past rather than any advance party of change. The departure of retailing, for the most part, from this older combined commercial district opened up space for the growth of the residual wholesaling. That activity could also economically preempt the low economic class of housing that tended to be built adjacent to the railroads, the artery giving life to warehousing. Thus, expansion within wholesaling tended to come in situ or outward from the original wholesaling district but parallel with major rail lines, rather than perpendicular to them, as was the common case for retailing.

The Emergence of the Complex City

409

Industry's demands for space tended to be rather large in relative terms, while once freed of dependence on securing nearby worker housing it might move anywhere on the periphery of the metropolis where spacious and cheap sites were available alongside rail lines. The spread of factories thus came on relatively cheap sites at the physical edge of the city. There might be remainders of plants in the older traditional core of the metropolis, but the only growth there tended to be in those industries for which central location, and its greater call on all routes of distribution within the metropolis, was critical. Newspaper publishing, baking, brewing, and some other perishable-food production found great value in the availability of intra-metropolitan transport within immediate reach of central sites. Most industry gained little advantage from core location once workers secured intra-urban mobility from the trolley. Factory owners found the lower capital, and often construction, costs of peripheral location useful in conserving invested capital for experimentation, advanced mechanization, and marketing effort. As the railside sites increased in size and number with outward shift, the type of rail transportation that mattered to manufacturers became more easily available if they moved toward the edge of the metropolis rather than remaining in a cramped and expensive central location.

The common single-family residence was purchased by those with the smallest ability to extract economic advantage from a specific location, particularly when intra-urban transportation tended to be spatially uniform because of the flat nickel electric-traction fare. The main economic gain that might be secured from a specific housing site was cheap land costs, a fact that greatly encouraged those with relatively modest incomes to search out lower-income suburbs, commonly recently built on the cheapest land at the edge of the metropolis. The only other place where such cheap housing might be available would be in areas abandoned by those seeking more pleasant environments for residence. These districts of abandonment and succession were frequently found in housing areas intermixed with older industrial, wholesaling, and transportation land uses, where environmental conditions could be undesirable both physically and socially. There was commonly a social factor in this choice between relatively cheap housing at the edge of the city and similar provision in environmentally undesirable districts nearer the core. Those with casual jobs requiring daily or at least very frequent rehiring or those of recent immigrant status, and thus commonly living within groups speaking their language and practicing their social customs, tended to opt for the core, whereas those with only a modest income but who had been acculturated to the city commonly selected the outlying lower-income suburbs. This division tended to be reinforced by the continuing employment of the now native population in the factories, transportation installations, and trades and services of the suburban-satellitic band. The lower-income "reception area" of the central city might offer no cheaper housing than the cheapest suburbs, but until the wage-earners secured reliable and continuing jobs in that outer band, those suburbs were impossible territory for residence. It commonly took immigrants time to secure those reliable jobs, so the reception areas remained a functional necessity to the recent arrivals. Environmentally, the central areas were

poor and to keep rents down the crowding was great, but unlike the case before the advent of good, cheap mass transit, the core tenement area was no longer the only solution to blue-collar housing. It was a social necessity for recent ethnic migrants but not a true economic necessity for the whole working class. And with cheap transit, core-area businesses could be served by a labor-shed coextensive with the denser built-up part of the suburban-satellitic band.

Commodity-Combining Contrasted with Specialty Selling

The location of various urban activities in terms of land-rent paying ability has been accepted as the main land-assignment practice at work within North American cities since at least the turn of the century. We have considered it first in its broadest aspects, those that determine which of the major land uses will occupy what parts of the major components of the metropolis. We may now refine this broad analysis in order to examine how land rents sort individual retail functions within the shopping districts. To begin with, it is essential to distinguish between gross rents and those charged per unit area. Gross rents will reflect the establishment size, itself considerably a measure of the various commodity lines combined in a single firm's store. Within the history of retailing we find a significant distinction between commodity-combining and specialty shops, with a complex cycle observable. The earliest shops, those created as an adjunct to wholesale merchants' activities, tended to be reasonably specialized, though perhaps the oldest were more subject to variation because of the indefinite expectations of returns from long trading journeys to very distant ports. As these mercantile voyages became more routine, with established contacts in the Hong trade or with Liverpool, the lines of retail trade in the attached retail shops would tend to become more defined and reasonably limited. This sort of wholesale-tied retailing would, of course, be mainly limited to the largest towns, the colonial ports. Once in the newer, and normally smaller, cities, retailing would have to stand somewhat more on its own. In doing so the firm, to gain an acceptable level of entrepreneurial profit, would tend to combine a greater range of commodities. In these smallest places, this was the origin of the general store; in somewhat larger places, it would be the basis for the grocery, hardware, dry goods, and housewares stores of specifically focused but wide-ranging lines. Only in the largest cities might there be specialty stores—say, chinaware alone—unless smaller places took on such a strong wholesaling role that they might gain the specialization possible in a retailing-wholesaling coupling. Chinaware wholesaling in Kansas City led, for example, to a retail shop specializing in china soon after the Civil War.

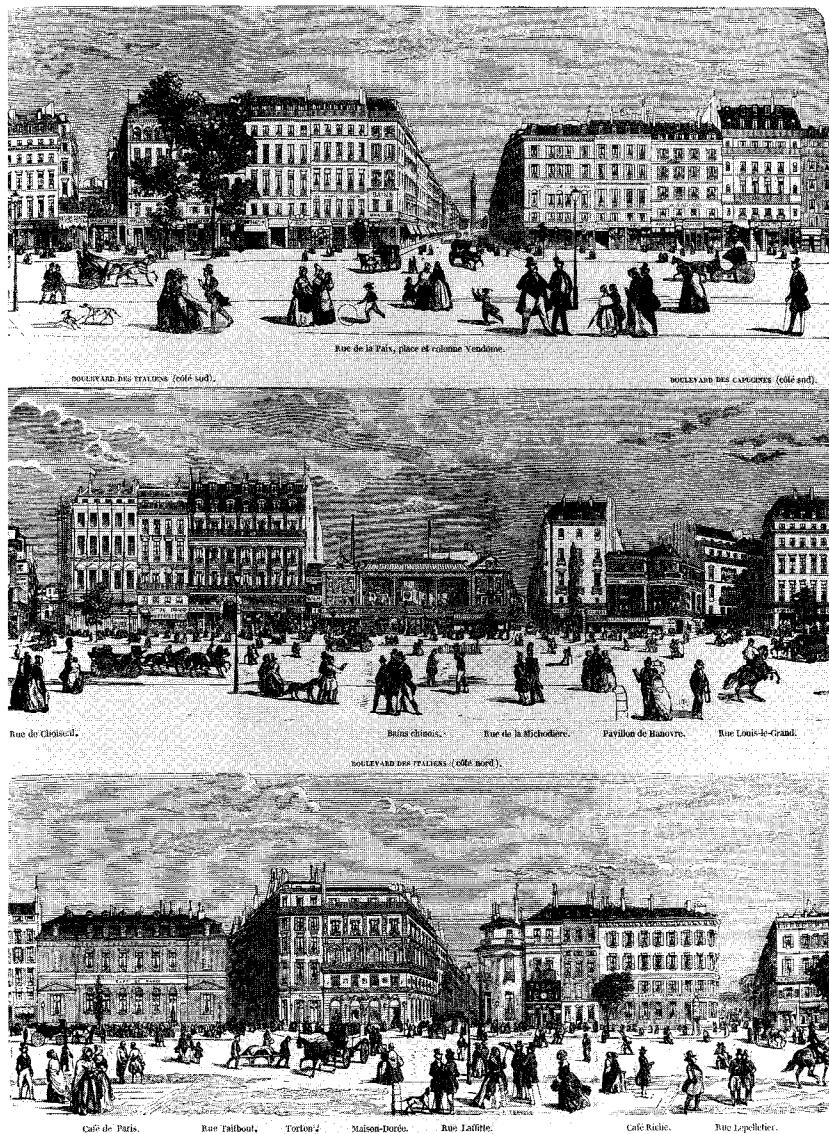
The importance of this commodity-combining and specialty split in the matter of urban morphogenesis shows up in the early geography of the central shopping district. To begin with, specialization became the possession of only the largest cities, with the wholesale-tied specialization already noted standing as the main exception. The central district of very large cities became the locale of what specialized shops there were in America before the Civil War. At that time it took the largest local markets available, plus

the conflux of a smattering of customers from more distant places, to support specialization. Boston, New York, Philadelphia, Baltimore, and Montréal were the first North American cities to witness such specialization based on local market and visitors. As St. Louis, Chicago, New Orleans, San Francisco, Toronto, and Winnipeg grew they began to develop a lesser array of specialty shops backstayed more by their wholesaling functions than a local market, which was still small by comparison with those in the colonial entrepôts. These early specialty shops dependent in part on visitors would show a clustering near the terminals of longer-distance transportation. We still find this, for example, in the clustering of camera shops near New York City's rail terminals. In contrast, those shops combining many lines, which might be little more than larger versions of the same thing in lesser cities, would show a particular orientation toward the conflux of local transportation. Because these commodity-combining stores would tend to be larger in size, they would tend to occupy extensive premises and must do so quite close to the nexus of local transport, though perhaps not always directly on top of it because of their considerable spatial extent.

Here we find an interesting split within specialty shops. Those of great specialty, where there might be no more than a single shop in a metropolis and its extensive hinterland, could be located peripheral to the central shopping area, often toward the rail depots, while those specialized in trade but frequently enough visited to permit several examples in a city would tend to seek a site as close to the focus of local transportation as possible. The antiquarian bookstore might well serve as an example of the first and a shoe store of the second. The bookseller could easily operate anywhere within the central shopping district, but the shoe store owner could not. He must be at the conflux of local transport, commonly adjacent to the most important cluster of clothing stores. There is the classic question of where two ice-cream cone sellers on a beach would locate; the answer has consistently been stated, "Side by side in the middle of the strand." Applying this concept to the city, where specialization led to several competitive establishments, they would be likely to locate close together and at a point logical for the conflux of customers of their particular sort and coming from the entire metropolis to that central point.

The Rise of the Giant Commodity-Combining Establishment: The Department Store

The locational requirements of the commodity-combining shops were in contrast to those of specialty selling. We have seen that commodity combiners were the pioneer merchants in most smaller cities and country towns. They also played a major role in the larger cities, but in those places their appeal was quite different. In smaller places the commodity-combining shop was there because only by lumping a number of submarginal profits gained from individual lines could an entrepreneurially acceptable total profit be reached. In the larger city the rise of the department store, in simple terms another form of commodity-combining operation, came not from an interest in lumping profits to gain a threshold profit, but rather from the desire to gain



The Boulevard des Italiens was a fashionable shopping street in the Paris of the Third Empire and the site of many specialty shops.

a competitive edge over specialty shops by charging a lesser unit profit on each item sold in order to sell the goods more cheaply. Such a policy could only prove successful for the merchant who gained such a large volume of trade that a vast number of smaller individual profits could be totaled to form a substantial entrepreneurial profit. Having said that, we easily understand that the department store needed to be in a place where access could be had to a large block of customers likely to shop in it.

The department store is generally agreed to have come into existence in Paris in the middle of the last century. There the Bon Marché, whose very name signaled its emphasis on low prices, began operation on the Left Bank in 1852, drawing customers from a much wider segment of the population than had the previously existing specialty shops. Quickly the Right Bank

came as well to house several competitors in what might be thought the primordial state of the department store. Aimed at a working-class as well as higher-income group, these early department stores, those founded before the wide availability of public transportation, showed a regionalization within the largest metropolitan areas. In Paris the major department stores came to be located in four different districts, three on the Right Bank where the greater population resided. In London, they were spread fairly widely within the city. Boston, which had one of the earliest American department stores, Jordan Marsh, because of its smaller size had less dispersal, but still some. It was only when the subways were constructed in the 1890s that the first dispersed pattern within the downtown began to contract, an eventuality that Eben Jordan clearly anticipated when he became a staunch supporter of the first subways, two of which intersected in front of his store.

In Paris the size of the city population, and perhaps its continuing occupational and class complexity, has allowed department store dispersal to remain even in this century when the Métro has furnished probably the finest urban transit in existence. Further support for the argument that class-consciousness may encourage department store geographical spread is to be found in London, where the Underground, less dense in pattern than the Métro but still adequate to overcome extreme urban districting, has not drawn all large stores to one place. Over time the more working-class examples toward the east in London have disappeared, but the posh shops to the west have not gravitated to Oxford Street, the transportation nexus that has become the site of the largest department stores. Further support for this weighing of the relative force of transit and class in the location of department stores is found in New York, where the traditional site for department stores on or near Lower Broadway began to be abandoned soon after Penn Station was opened in 1910, though the last "downtown" department store, Wanamaker's, did not close until the early 1950s. The superior conflux of subway services near 34th Street worked this major geographical shift. During the last twenty years a further northward shift has taken place as subway service to the Upper East Side has been improved and the practice of suburban residents flowing into Manhattan to shop, often by commuter train, has declined. Currently, the major complex of department stores in New York is adjacent to the intersection of Lexington Avenue and 57th Street, leaving the Herald Square stores, Macy's and Gimbel's Herald Square, as the largest establishments in the metropolis but no longer the goal of the greater number of shoppers. They go to more local department stores, dominantly in the suburbs but within the core as well at 57th Street. This sort of replication of department stores could come about only because in the United States the department store tended to avoid a narrowing of tributary population by too strong a class orientation. With the continuing rise of urban populations, these basically popular department stores could branch out without losing their acceptable entrepreneurial profits in each branch. This development further bore out the dominant role of transportation in the location of American department stores. The greater role of class in Britain, for example, tends to keep the department store as a downtown phenomenon or else, as in the case of the rather snobbish Harrod's, as a neighbor to the wealthy.

The location of department stores certainly reflects public transportation, and shifts therein, but the precise placing of these often huge establishments creates a seemingly magnetic force drawing other shops within its strong field, in a normative pattern that we see repeated in most large cities. This replicative pattern is clearer in North American cities, from Montréal to San Diego, than in European ones, where contrasts in history, morphology, and society contribute to a somewhat more varied geography of commerce. Thus, in order to state some general locational principles that apply to a large number of cities, I shall talk about North American cities, with only very short references to a few overseas cities.

The critical quality of the department store is its role in shaping a normative magnetic field that permits us to talk in general terms about central shopping districts. Before the advent of these great stores, in that critical half-century of peace after Appomattox, central areas seem to have responded more to the needs of wholesaling than to those of retailing, often leaving the sorting of commercial functions to the needs and desires of extrametropolitan customers. With the advent of the department store, the metropolitan needs gained ascendancy, the divorce from wholesaling took place, and the pedestrian became the dictator of choice. The latter fact may seem contradictory, so much having been made of the role of the trolley and, later, rapid-transit lines in the location of the central shopping district. To understand the point, however, it is only necessary to make a distinction between access *to* the shopping district and access *within* it. Electrified public transit did provide the major part of the access to the district from other sections of the metropolis, with steam railroads—and in a few cities steam ferries—providing virtually all the rest. Thus, the site of the central shopping district was given by these broad alignments of public transit. Once sited, however, the internal ordering of the shopping district, then as today, came from the realities of pedestrian movement. Because people have changed little over the last century, their increased height only fractionally enhancing their speed of walking—perhaps to be countervailed by a smaller dependence on their legs, such that they lack in stamina what they may gain in speed—the nature of that internal structure has changed little geographically. It has, however, changed greatly architecturally. As central business districts have experienced greatly increasing demands for space, they have not been able to add great geographical blocks to the core save in one of two ways.

The Rise of the Office: The Elevator

The first incrementation to the city came through the specialization of use by sector within the central business district. Originally, these districts had seen shops on the ground floor with offices, even of banks, on the second and other upper stories up to a total of no more than five stories. With that height limit established by human stamina, and to a lesser degree by building techniques, growth could come only by separating these office and store functions, introducing two functional units each capable of growing to its own "pedestrian limit," a distance of no more than a few hundred yards. What resulted was an office "walking zone" a few hundred yards across,

normally served by railroad stations where workers could arrive on commuting trains and out-of-town business visitors by regular long-distance trains. Adjacent to it, and commonly away from the nexus of distant and outer-suburban transportation, there would be an additional walking zone for shopping, commonly later in development and more related to intra-metropolitan transit than the first zone, now commonly called the financial district. Each of these zones had a lid of around five stories placed on it until the elevator came into common use in the years after the Civil War.

Experience with the elevator varied between these two zones. For the financial district that mechanical lift was of critical importance, because much of the movement tended to be internal to a rather clearly defined group of employees in a single organization or in a modest number of commonly related organizations. In that situation the walking zone limits could be reached within a few adjacent buildings, as in the structures built to house a legal community, a medical one, or even a single very large insurance company. To allow this repeating circulation by employees, the elevator afforded the main improvement that could be secured in "transportation." It seems to me not at all a matter of chance that the earliest skyscrapers to be built, those in New York and Chicago, were constructed predominantly for

The constant increase in the scale of office functions required frequent enlargement of office buildings. In this case we see the 1886–87 enlargement of the Equitable Building at 120 Broadway in New York (the earlier form is shown on page 375 for 1875).



**The
Continuing City**

insurance companies and were among the earliest buildings to be equipped with elevators. Large metropolitan newspapers were other early entrants into the construction of skyscrapers, again finding a great advantage in piling large numbers of workers on top of each other and thus, by elevator, being able to secure rapid personal intercommunication.

Within the office zone the elevator and the emergent skyscraper served quite well between the wars to afford the growth in space needed. Even so, in the largest cities, particularly those major colonial ports or great railroad junction cities—Boston, New York, Philadelphia, Baltimore, St. Louis, and Chicago—there was a tendency for separation of functional groups even within the so-called financial district. The lawyers herded together; the brokers clung to the environs of the stock exchange as closely as did legislators to the call of the voting bell; and shipping companies looked down on the head of the wharves as they had done when that locale was the near totality of the city commerce. Association of those in a particular trade was repeating, and time was important even before computers. To associate quickly and frequently meant a separation of office functions into subunits within the financial district. There might be an occasional association of sorts among most of the subunits, but it would likely be much less frequent than that working within the subunit itself. What clustered the units together was probably not, in fact, this often rather infrequent association among subunits but rather a shared dependence on the railroad station, as the destination of commuters and the place where distant customers and clients arrived and departed. Also, for those office functions that were so distinctive as to avoid great interaction with others of the same precise occupation, there would be quite localized service establishments—law offices, banks, telegraph offices, and the like—that would set up shop in the financial district as the place most convenient to the greatest number of their customers. In gaining access to those services, and to distant clients coming to the city to visit such an individual office, office buildings constructed for general rental would also seek to be within such a financial district near the railroad station.

If the elevator, and the skyscraper it made practical, transformed the financial district during the final twenty years of the last century, its impact on the shopping district was quite different. The question was one of "establishment scale" and the nature of clients and customers. Offices frequently were highly internalized institutions, dealing with fellow office workers and often with a relatively small number of people per day. The elevator served well in this situation. For the customers of a large store, the service was more difficult, though the lift did permit the expansion of the department store above the five-story ceiling of its early decades. It is impossible to establish what the new ceiling was once elevators were introduced, but the experience of hundreds of department stores around the world bears out the general conclusion that eight to ten stories seems to have been the practical limit. There are a few examples higher than that, but the highest stories were commonly occupied with office and other divisions of the operation that required less access by customers than the selling floors. And for firms other than the department store, where the combination of many lines of merchan-

**The Emergence
of the
Complex City**



This etching of South Station, Boston, shows the conflux of public transportation that supported most large-city business districts. Shown are the station (then the busiest in the world), the elevated railway, and the subway system (the first in the Western Hemisphere). Margaret Philbrick, 1937. Used by permission.

The Continuing City

418

dise in a single establishment was an entrepreneurial necessity, the ceiling on retailing seems to have been considerably lower. Furniture stores, with their huge space demands, and some specialty stores in New York and Chicago, where space was scarce and expensive, seem to have been the only other examples of retailing carried on much above the second or third floor. For most of the land within the shopping zone at the center, the height of retailing was no more than three stories and in many places only a single story. Upper floors, if they existed in a building, were likely to be taken up with storage.

Geographical Growth of the Central District

What this tells us is that the elevator had a much less emancipating role within retailing than it had in office activities, hotels, apartment houses, hospitals, and other "residential" functions. For that reason the architectural expansion of the shopping district was less than the general growth in retailing required. In that situation, as in most other problems facing metropolises, if architecture could not suffice, then geography must. In seeking a geographical solution to the expansion of the shopping district, retailers faced the same pedestrian constraints as those seeking to expand the financial district's office space. The notion of the walking zone persisted within

the shopping district, limiting the overall extent of a fully integrated area. A generation ago it was shown that around four hundred yards was the greatest distance that shoppers could be confidently expected to walk in their shopping peregrinations.¹⁶ Thus, if the shopping district needed to be more geographically extensive, in light of its being kept wide-ranging by the rather low building ceiling characteristic for retailing structures, that greater extent must be gained by an internal separation of retail functions among several walking zones, each given over to a specialized cluster of shops. The inherence within a cluster would come from the common association in customers' minds of that particular grouping of shops such that in a search for a good or service those customers would logically look toward that particular walking zone. Thus, in women's fashion clothing, say, there would be great advantage attaching to a location near the largest magnet drawing women to the city, that is, the department stores, if an establishment sought to present its fashion clothing to women in general.

The walking zone division of the shopping district would have these tracts of inherence but they, unlike biological cells, would not be morphologically and functionally exclusive one from another. Logical, and commonly the case, would be the situation that toward the edge of one tract there would be an element of integration with the establishments and functions located in an adjacent tract. For example, in looking for the location of men's clothing stores within the American city before World War II, those stores were commonly intermediate in site between the general fashion clothing tract—the home of the department stores and women's fashion clothing shops—and an office tract within the financial district. For this male-oriented clothing area, much of its custom would come from the large number of white-collar workers in adjacent office tracts. A test of the validity of this assumed association by adjacency has been provided by the considerable rise of women's fashion shops within, or closely adjacent to, office districts during the decades since World War II, the operative principle being that women have risen considerably both in numbers and in pay scale within office institutions since 1945. Thus, in seeking to understand the location of various retail establishments we must consider several functional principles: the existence of the walking zone tract of related activities; the interaction with adjacent tracts that will be found in the land use at the edges of these units; and the dependence of all core-area tracts on public-transport networks to support their existence, often dependence on different forms of transportation by specific activity. Retailing has, since the turn of the century, been most intimately tied to rapid transit, whereas financial district offices have leaned much more heavily on rail commuting wherever it is available, and wholesaling has relied on public freight movement, originally by rail but increasingly by motor truck.

16. Raymond E. Murphy, James E. Vance, Jr., and Bart J. Epstein, *Central Business District Studies* (Worcester, Mass.: Clark University, 1955). This work, for which I was the main field investigator, forms the basis for the initial conclusions of this section, revised by some thirty years of further observation of shopping districts on five continents.

The Emergence of the Complex City

419

A Model of the Central Shopping District

If the location of retailing responds to general forces, we may then attempt to establish a common model of store location within a modular central shopping district. Obviously, the very large and the very small cities—those among the latter that possess true shopping districts—will tend to depart from this model, but its presentation allows us to summarize many relationships in a small compass.

The traditional fulcrum on which all central shopping district functions are balanced is the former or present intersection of major electric-traction lines, even in cities that no longer possess such traction, having substituted buses for trolleys of one sort or another. Where the trolleys met, even if they no longer do so, tends to be the anchor of the district. Around it stores would be ranged in response to a fairly simple system of land rent, but itself often the summation of a complex set of interacting forces. The matter of walking distance we have already considered. Along with it went a special form of distance decay under which building lots well removed from the conflux of transit routes that sites the district in space had fewer pedestrians passing on their front, to the point that pedestrians were likely to disappear from the fronting sidewalk that some three to four hundred yards from that transit anchor. As virtually all movement within the shopping district was in the past, as now, largely on foot, a location too far from stops on public transit was effectively ruled out for retailing, save for those types of trade so specialized that they might depend on the uncommon use of individual transport—horse-drawn cabs in the nineteenth century, taxis more recently, and cars today for the prosperous who can afford high central-area parking charges.

Other factors that determine land rents in addition to this distance decay are the nature of retailing carried on in the walking zone, proximity to the financial district, adjacency to hotels, and association with high-rent, high-density housing structures. What this says is that land value comes from relative location and from developed use of land. The initial value may come from the location, but that figure is then inflated or deflated by the use that comes into existence on the lots. Not all land similarly far from the fulcrum has an equal value, even though part of the value of any site stems from its distance from the conflux of transport.

The department store, as the magnet drawing the greatest number of shoppers to the district, will be located near that fulcrum, either because the proprietors of these great stores had no funds to occupy such choice sites or because they created the neutrality that came to surround their stores. No doubt in some cases the presence of the department store, particularly several in close proximity, shifts the value to the site. The clustering of department stores near Lexington Avenue and 57th Street in New York has greatly enhanced the land values in that location even within the last generation, when transport has not changed greatly but land use has. Once a major department store has become fixed near the heart of the shopping district, where the peak flow of pedestrians on the sidewalks is likely to be, land values reflect that concentration and a peak land value intersection is normally to be found there. Land values drop off absolutely in all directions, but

not at the same rate, because the land uses, and possibly the access, vary by vector of movement away from the peak value intersection. If the terrain is difficult, or railroads, highways, parks, or other obstacles to movement of shoppers intervene, the decline in land values will be much sharper. Where an adjacent financial district or a hotel cluster occurs, the large temporarily resident population tends to enhance pedestrian flow and to provide likely shoppers, thus keeping land values higher and producing a slower decline along that vector.

Once pedestrian flow has become relatively fixed in its various routes and volumes, the major determinant of land values has been established, giving a pricing to space in the shopping district. It might seem that price is the only determinant of the location of shops, with those best able to pay rents preempting the most central lots, as general theory has it. But price is only one of several forces at work. Association becomes very important in some instances, such as the locational interaction of shoe stores and women's clothing shops with the department stores. In that instance, high price of space and intimate association go together. But in other cases, such as the interaction among antiques shops—it seems they are on occasion the best customers for each other—or camera, book, and sporting-goods shops, the important association may come well down the price slope at some distance from the peak value intersection, even when they may be highly profitable establishments. The control of this form of associational location comes from the practice of comparison shopping, which grew up with the enlargement of shopping areas and increases in tributary population such that several shops selling the same line came into operation and thrifty customers would search in each before making a purchase. These associations of shops created clusters within the shopping districts, with their location in relation to the peak value intersection determined by a dichotomous situation: some of these clusters, such as those for women's clothing, were intimately linked to the department stores, and thus would have to pay high land rents to gain the competitive or supplemental association they needed; others had no considerable linkage to the truly core functions, and thus would tend to pay lower rents, though they must cohere one with another in just as strong a cluster as any other specialty. Sometimes that specialization comes from access to adjacent land users not located within the shopping district, say to apartment dwellers in nearby housing areas or to office workers in a proximate financial district, as in the furniture stores and delicatessens near tall apartment blocks and the stationery and office-supply stores near the financial district.

What this says is that the oversimplification of store location—frequently presented in any purely economic analysis of the shopping district—needs revision. Money counts, but other things do as well. The limits of the walking zone, the values of association, and a further factor—social evaluation—enter into the location decision. Certain types of retail and service activity have come to be seen in customers' minds as being undertaken in particular places. High-style specialty clothing for women has gained geographical connotations. Although Paris invented the department store, haute couture in the City of Light is not to be found in the department stores, or even as near neighbors to those massive magnets.

Instead, the Faubourg St. Honoré, close to the longstanding socially prestigious part of Paris, became the most approved site for designers and their intentionally exclusive products. In this case geography gave prestige, as it often does in the city. As high fashion spread more widely, with the establishment of fast verbal and graphic communication within Western society, the same geographical separation of haute couture from the department store complex came to be found in New York, Boston, Chicago, Los Angeles, and other large and prosperous places. By the 1920s Fifth Avenue, without a subway or an elevated, and thus more exclusive in access, had taken over the high-fashion role in New York. Boston had made of Newbury Street a smaller though no less esteemed shopping cluster adjacent to the Hub's distinctive in-town but not downtown suburban railroad stations, rather than to the convergence of the rapid-transit lines, though the ramp leading down to the Tremont Street subway was quite close. Chicago shaped its Miracle Mile, the first of what ultimately came to be a pretty mongrel breed, when emulation gave the term to serried used-car lots most distinctive for their massed lumens. On Michigan Avenue north of the Chicago River, high-style specialty shops lined a major boulevard adjacent to, but not within, the central shopping district. Los Angeles modernized the Faubourg St. Honoré for the Los Angeles scene by locating stylish shopping along the Miracle Ten Miles of Wilshire Boulevard all the way to, and beyond, Beverly Hills.

The trolley and rapid transit had made downtown shopping possible for the entire metropolis; the automobile at first concentrated high-style shopping on the edge of the downtown, but ultimately permitted, as we shall see, the dispersal of that exclusive merchandising toward the highest-income suburbs. Again, it was a social evaluation that did the deed more than any measure of land rent. Los Angeles demonstrates this point well. By the 1970s its central shopping area had gained a negative social evaluation in terms of clothing shopping, leaving Broadway as an obvious "ethnic" marketplace, dependent on the conflux of buses in a city without surviving electric traction. Customers for haute couture, even for its cheaper copies, do not ride the bus. In Chicago a similar fate seems possible despite the great efforts on the part of the city that brought two subway lines through the heart of the central shopping district after 1940. The growth on the Miracle Mile of North Michigan Avenue has been so great that even the epitome of the American department store, Marshall Field and Company, has opened a branch there within a mile of its downtown State Street store. Social evaluation is lowering the status of State Street, while in a rather isostatic movement North Michigan Avenue is gaining a scale of shopping development such that it is the area of appeal for the high-style component of metropolitan shopping.

The Social Evolution of Shopping

Today most large American cities demonstrate a striking reversal of the conditions that brought the central shopping district into being after the Civil War. Then, it was the creation of a mass-appeal shopping area, aided by and in turn aiding electric traction, that allowed the diversification of the

lines of merchandise that might be sold within the metropolis. Only at the center could an adequate market for many lines of goods be obtained.

With the advent of the automobile as a vehicle for the shopping journey of women, certain outlying convergences of highways became possible sites for mass-appeal shopping of the sort associated with the department stores and the type of shops clustering around it. After World War II much of this mass-appeal shopping was effectively moved away from the center when department store firms began opening branches in what came to be known as regional shopping centers on large tracts of open land within the suburban band. In due course we shall examine that development, but here it is essential only to note that much of the downtown shopping gravitated away after 1945. This left the central shopping district as the local shopping center for the population resident in the traditional city. That population was strikingly varied: it included some extremely well-off people who could afford to buy comfort and high amenities within the expensive and crowded core, and a much larger group of poor, often recently arrived and occupying the housing abandoned by the blue-collar classes once they had gained the necessary mobility to move to the suburbs. The sort of shopping that has developed along Broadway in Los Angeles exemplifies the local shopping center for the working classes living in the traditional city. The sort of shopping found from the 1920s onward along Newbury Street, North Michigan Avenue, and Wilshire Boulevard served first the prosperous of the inner parts of the metropolis. The reversal of the nineteenth-century conditions shows up in the decline of the central shopping district as a mass-appeal seller. Although absolute sales may have held up, this is not always the case in small and medium-size cities such as Grand Rapids or Tulsa, where there has been a virtual abandonment of the central district by retailers of clothing and other items traditional to the central shopping district. In all metropoles, the share of the center in total metropolitan sales of general and clothing merchandise has plummeted since World War II.

It is in the matter of specialized high-fashion clothing that the metropolitan core has held its role as merchandiser to an extensive urban region. In cities where the downtown department store may have shrunk or even departed for the suburbs like Wanamaker's in New York City, that same place may have experienced healthy growth in fashionable retailing. Boston's Back Bay seems fast to be overtaking the Washington Street district as the dominant as well as the more burgeoning of retail districts. Good rapid transit plays its part, though the conflux in the Back Bay is minor compared with the intersection of Summer-Winter and Washington streets. What seems to make the difference is the practicability of large parking structures such that the core upper-income trade can be greatly magnified by the continuing cityward movement of prosperous suburbanites, mainly by car, to make this the fashion center for the whole metropolis. In massive and very style-conscious urban regions, such as New York-northeastern New Jersey and Los Angeles, it seems that even very fashionable stores have begun to disperse, taking what had been the Wilshire Boulevard function to several much more peripheral shopping centers surrounded by a market of sufficient size to keep them in business.

The necessity of carrying our discussion of the forces at work shaping the central shopping district somewhat beyond 1945, the end of the period here considered, grows out of the desire to show the way in which social evaluation and shifts therein have tended to increase the component of high-style and highly specialized sales in the core area at the same time that mass-appeal selling there was declining heavily. This situation seems to be true of only the largest metropolises; in medium-size and smaller cities, the relative decline of the core tends to take place across the board. The conclusion is obvious: urban population has grown and metropolitan incomes have risen, so this decline can only have come about through geographical shifts in retailing. The integrated outlying shopping center is the patent cause. But because those centers have grown to national importance only since the end of World War II, it seems desirable to leave discussion of them until the next chapter. Here, however, it seems appropriate to anticipate the known evolution of the central shopping area by making it clear that the classic core shopping district developed progressively, and in response to the several forces here noted over a period of about fifty years (1890–1940), the time of the trolley and its rapid-transit elaboration. Subsequent rapid-transit developments, as in Toronto, Montréal, San Francisco, Atlanta, and several smaller places, particularly Calgary, Edmonton, Vancouver, and Sacramento, have all taken place in the era of automobile domination. In the Canadian examples, a complexity of conditions—the lower per capita disposable income in Canada (which has maintained the relative position of the downtown area in mass-appeal shopping), the more severe winters (which make driving less appealing for much of the year there), and the more arbitrary nature of planning in Canada resulting from the absence of a due process clause in the recent Canadian Charter—has allowed the new rapid-transit systems to be more like the prewar ones in their morphogenetic impact than those built since 1960 in the United States. By now, however, all North American cities seeking to create railed transportation must do so with full recognition of the continuing domination of even intra-urban transport by the automobile. The morphogenetic forces are now so transformed that not only the incrementation of the city formed in this automotive context—the suburban and exurban bands—but also the pretransit traditional core has seen a radical transformation of the prewar structure. The number of sizable cities with virtually no central shopping district today—Phoenix, Albuquerque, Grand Rapids, and Tulsa, for example—is considerable. They were not originally shaped that way; rather, they have been shorn of previously existing functions. The nature of that change will be considered in some detail in the next chapter. Here it is sufficient to note that the time span of this chapter, the half-century before the outbreak of World War II, saw the flowering of those central shopping districts. Even where they have survived, they show little new growth and have a distinctly autumnal quality.

Wholesaling, the Land Use of Mobility

Wholesale trade is a peculiarly obscure aspect of American economic life, given the fact that it is critical to the functioning of any advanced society

and that its volume considerably exceeds that of retailing. This was not always the case; as we have seen, until the middle of the last century retailing and wholesaling were commonly joined in a single mercantile establishment. When retail trade seemed to require different skills and a separate location from wholesaling, there were as well sound reasons for wholesale trade to become independent. The geographical fields of endeavor of the two types of trade were sufficiently contrasted to require quite distinct forms of commercial intelligence, as well as contrasting times of entrepreneurial anticipation. The most common wholesalers had to find their market spread over an extensive region, a region much larger in the last century than the metropolis because that settlement form was just coming into existence and was frequently too small in trade to support an active entrepreneurial merchant. Distant retailers buying from wholesale establishments might supply an appraisal of what they wished to purchase at a particular period of time, but they could hardly present an encompassing view of the larger market or often of the long-term demand for goods likely to be found within it. It was skill in anticipating the answers to these two sets of questions, and on the basis of those answers seeking to establish a continuing and timed flow of goods to meet demands as they arose, that taxed wholesale merchants and rewarded them when they found the correct response. For retailers, there were similar questions of volume and timing of goods, but they operated (then) within a confined geographical sphere wherein commercial intelligence had to be far more detailed. The wholesaler had dozens or hundreds of customers; the retailer hoped for thousands or great multiples thereof. The retailer then had little concern for transportation. People shopped and took most of their goods away with them. The wholesaler not only had to deliver goods, commonly in large volumes, to customers, but had to arrange their shipment from manufacturers to a warehouse long ahead of expected sale and frequently from a great distance. Then as now, the wholesaler could not seek their delivery to the receiving dock too far ahead in time lest vast capital be immobilized over an unproductively long period. The wholesaler's establishment, thus, became almost entirely dependent in location on the lines of distant transportation. Only those wholesalers whose market would be largely restricted to the city or the metropolis—produce merchants and the wholesaling aspect of commercial banking, for example—had to give much thought to the transportation available internal to the city. It was this peculiar concern that placed produce-wholesaling districts very central to the city, so that restaurant chefs and the owners of small food stores could call for and carry away their lettuces and tomatoes. But even these types of wholesaling dependent on customer calling still normally required access to a regional or national transportation network by which they could secure perishable products quickly, cheaply, and reliably. Thus, it was the external connections leading to and from the city that sited the wholesaler's warehouse, while it was the flow of customers to the retailer's shop that placed that establishment within the city.¹⁷

17. This section is based heavily on my book, *The Merchant's World: The Geography of Wholesaling* (Englewood Cliffs, N.J.: Prentice-Hall, 1970), one of the very few monographs dealing with wholesale location and the forces that shape it.

We have seen that transportation played a major role in siting the central shopping district, but pedestrian movement was the critical force in the internal organization of that district. In wholesale trade, organized transportation was always the dominant force, with pedestrian movement of little or no importance. Thus, we seek the explanation of the characteristic placing of warehouses and other wholesaling establishments in the patterns of long-distance transportation. The waterfront in the colonial ports and the early-republican river towns was the first location of warehouses in North American cities. Only as railroads reached these older cities was there any limitation of that generalization, and even then not so great a relocation of warehouses as might be thought, because railroads tended to go to existing centers and to be built on graded routes along river valleys. Only as the volume of wholesaling in a city expanded was there the likelihood that the newer establishments, or expansions of older firms, would be commonly found along the rail lines coming into the city, away from the river as well as along it. Because sites available, even on the landward side of riverine cities, were fairly limited—within practical reach of the center—warehouse construction tended to be multistory. A strong influence on this architectural morphology was the perfection of the elevator, for freight as well as people, already discussed. In simple truth, for most of the second half of the nineteenth century the technology of goods handling was more advanced vertically than horizontally. Boxcars were still unloaded by hand, with crates and boxes moved by human muscle-power. Only when raised to higher floors was mechanical assistance of much use. Thus, piling up stories, so as to limit the horizontal spread of a warehouse, was advantageous, with the ceiling on height imposed primarily by current building technology, which depended on weight-bearing masonry walls. Massive structures emerged, such as Marshall Field's Wholesale House, covering a large lot to a height of seven stories, and on cramped sites sometimes to as many as ten stories. The introduction of iron- (later steel-) cage construction encouraged this lofty development during the twenty years before World War I.

Examining the remains of warehouse construction at the turn of the century, we find that it showed a congregation of structures such that we might at first think there was a strong associational value in wholesaling, just as there obviously was in retailing. But further investigation clearly demonstrates that the clustering in wholesale trade has an additional component beyond gaining access to the same customers as one's competitor. That addition comes from the operating characteristics of North American railroads at the end of the last century. Freight trains brought loaded boxcars to the city from afar, and the process of separating the train to deliver individual cars was quite specific. Railroad companies established so-called yard limits within which cars would be spotted on a firm's siding without additional charge beyond the long-haul rates. To make this system work, the company sidings had to be reasonably placed in relation to the freight yards, normally then as near the city center as possible. In addition to this necessary location within the yard limits, there was an even more geographically constraining force, that exercised by the out-shipment of goods from the wholesaler's warehouse. Normally, wholesalers received their goods in car-

load lots, that is, in full boxcars sent by the manufacturer to a single wholesaling warehouse, where the goods would be promptly unloaded and stored against future orders from the merchant's customers. Those orders were frequently, though not always, for considerably smaller amounts of goods, such that out-shipments were commonly in less-than-carload lots (LCL) of a single item. The wholesaler sought to lump LCL items to be sent to a distant customer so as to make up a full carload shipment, which might then be dispatched by rail in a full boxcar loaded at the merchant's warehouse. But frequently the exigencies of time, which do enter into wholesaling even if less urgently than in retail sales, meant that the wholesaler must dispatch a smaller shipment, not waiting to make up a full carload. Under the operation of railroads in the era before the introduction of the motor truck in long-distance transport, which comes mostly only after World War I, these LCL shipments had to be handled by transportation companies specially organized for that purpose. Freight forwarders rented boxcars from the railroads and sought to solicit wholesalers and other shippers for package freight sufficient to fill those cars for specific destinations within a short period of time. In that way individuals could gain a use of the railroads for small shipments in the era before package mail was introduced, by the great department store owner John Wanamaker, who was postmaster general in the Harrison administration (1889–93). Where freight forwarders were unavailable or circumvented, the railroad companies commonly maintained a "freight house" in a city where LCL freight might be assembled into carload lots. In this era when package mail was not available or just starting, there were as well a number of express companies—Wells Fargo and American Express started in this activity—that handled small shipments in an expeditious way. They, in turn, had taken over from a very informal arrangement inaugurated on the railroads of southern New England early in the American railroad experience, whereby passenger train conductors agreed to accept packages or letters for deposit at a city at the end of their run. The freight house and the express office could serve as a point of assembly of package freight only by standing near the center of the city, obviously alongside the railroad. Given that location, wholesalers, who were heavily dependent on package freight for shipments to their smallest or most impatient customers, had to be as close to these structures as possible.

The scale of the wholesaler's operations, the need to be at a railroad siding for the in-shipment of goods, and the value of being near the freight houses and express offices joined to shape a characteristic location for warehousing once wholesaling and retailing had become separate, as they commonly were by the turn of the century. That location was along the rail lines adjacent to the central shopping district. When the separation of retailing from wholesaling had begun, the former tended to move away from the previous joint residence, leaving the district adjacent to the railroad station to warehousing, save only along the one or two streets leading from the office and retail districts to the station to be occupied by specialized retailing intended to capture the impulse buying of commuters walking to and from that station. Bakeries, wine shops, candy and flower shops, tobacco- and newsstands, bars, cobblers, and other enterprises intended to

catch the attention and trade of the vast flow of pedestrians using the station to gain access to the city core could benefit from this human river. Once beyond its banks, however, this band along the rail lines would be given over to the wholesaling that benefited from the easy access to freight-handling facilities.

In the traditional wholesaling structure that evolved in the second half of the last century, there were agents facilitating this trade who dealt in orders rather than the physical holding of goods. These were manufacturers' sales agents whose job it was to enlarge the sales of particular factories by being readily available in a major city to provide information on the goods, to speed up their ordering and shipment, and to engage in the active promotion of sales within the urban region. These were operations dominated by the needs of personal access, particularly for those likely to come to the city by train from some distance. The result was that such sales agents tended to seek to occupy office space not far removed from the station, perhaps most commonly in the upper stories of buildings along the arterial routes leading to the station, leaving the first floors to the shops seeking the impulse sales mentioned above. In large cities, particularly the colonial ports and the early river entrepôts, a considerable proportion of the office space might be rented out to such agents, contributing a major component in the filling up of an office district and providing a considerable clientele to the city hotels that tended to cluster around the station and onward toward the office district. In the masculine gratification of the times, this area transitional between wholesaling and office functions adjacent to the hotels and not far from the central shopping district became the location of the better, and fully ample, restaurants that came into being in American cities after the Civil War. These strongly masculine institutions, not infrequently refusing to serve women in certain rooms or at certain times, took on much the function that the coffeehouses of London had served in the seventeenth and eighteenth centuries, and that Lübeck's Schiffergesellschaft has held from 1535 to the present. These restaurants, normally with a most active bar, became the venue for business meetings, as described in Thomas Mann's account of Thomas Buddenbrook's lunches at the last noted restaurant.

The Rise of Interurban Trucking

The rather tight clustering of wholesaling in the period before World War I began to change at the close of that conflict when many motor trucks were first adopted by city business firms. The war had proved the strength and utility of trucks that could operate on any road, carrying a load sufficiently smaller than a boxcar to make them useful in the delivery of goods to the ultimate customers of wholesalers and retailers. This modification of transportation began a transformation in land use that has continued down nearly to the present. First, it was particularly in the onward shipment of goods from wholesalers' warehouses that the truck proved itself, but initially only in delivery to those customers within the city and its metropolitan area. In part that constraint was a reflection of the poor state of rural roads even in the more densely settled parts of the country. It was only in the 1920s, when

states pushed their efforts at road building and the federal government commenced the active financing of arterial roads, that the horizon for trucking moved farther from the city. By the late 1920s most eastern cities were tied to other urban places in the region by organized truck routes, as was also the case in California and the West Coast in general. There was little or no transcontinental trucking and no heavily used network of subcontinental lines. But as most wholesalers served a region considerably below the level of subcontinental extent, the impact of trucking could be significant in this first decade of the motor transport industry.

The introduction of trucking made possible the casting adrift of one of the two anchors that had greatly constrained the movement of warehouses before the war. No longer were the freight houses and the express offices so important to these large-scale merchants; instead, importance attached increasingly to access to the arterial highway system emerging as the significant state and federal routes took their place. But access to those routes was, by its linearity, far less confining than the railroad yard limits had been, permitting warehouses to be set up anywhere it was possible to establish a siding within easy reach of a major highway. The railroads found that to continue handling these incoming shipments, particularly where they moved over regional but not larger distances, they must accommodate the wholesalers by moving the yard limits outward, sometimes to the physical edge of the city.

This outward movement of wholesaling also made land for potential warehouses much cheaper, because the increase in the available space was so greatly expanded with radial departure from the city. Cheaper land encouraged merchants to construct lower buildings that could be built more cheaply because of lesser loads to be borne by the foundations and columns. The adoption of truck transport for shipments from the warehouse encouraged the use of large outlying sites where it was easier to maneuver and park large trucks. The shift in the geographical morphology thus led to a fundamental change in the architectural morphology associated with wholesaling. Up to the outbreak of World War II, this siting of warehouses mainly at the interface of rail and road transportation became the American standard, demonstrating that the advantages gained in handling large volumes of goods outside the core could be obtained once trucks distributed wholesalers' wares, and that warehouse employees could manage to reach these peripheral sites using cars of their own.

While the great warehouses were being shifted outward, the office aspects of the trade remained heavily in the center, though changes began to be discernible. Manufacturers' sales agents, whose trade depended on providing services for customers who were heavily concentrated within the metropolis, began to shift to locations on the arterials leading from the central district, where they could easily be visited by a local population using cars and trucks. The same rationale that caused Sears, Roebuck and Company to set up its "men's department stores" on the outskirts of downtown caused the National Cash Register Company, the Hobart food machinery firm, and appliance and business machine wholesalers providing repair services to cling in an elongated band strung outward on these major metro-

The harbinger of a transformed retailing structure in cities was the automobile-oriented men's department stores opened by Sears, Roebuck and Company in the 1920s. Shown here is the Lawrence Avenue store opened in Chicago in 1925. Note the tower that remained the attracting symbol of these stores until well after World War II.



politan arteries. In this way the wholesaling pattern of the metropolis just before World War II had three basic elements: the remnant of the much older, entirely rail-oriented warehouse district at the very center; a thin line, commonly intermixed with automobile-oriented neighborhood retailing extending out along several heavily trafficked arteries; and a large and rapidly expanding string of massive warehouses located between rail lines and major regional highways, well toward the edge of the built-up city and frequently beyond the corporate limits of the germinal city that had brought the metropolis into existence. Although there have been major changes in this pattern during the last thirty years, discussion of the transformation will be reserved until the next chapter where the "modern city," that of the post-World War II years, will be considered in its complexity.

Geographical Revolution in Industry

The Industrial Revolution of the early nineteenth century began the shift of industry away from the colonial ports, where it had previously been concentrated until the introduction of machinery elevated the availability of waterpower to dominance in industrial location. The mill towns might be close by the cities, as Pawtucket was to Providence and Waltham to Boston, or sufficiently removed to become important cities in their own name, as Lowell, Lawrence, Manchester, and Fall River became. At least until the time of the Civil War, this distinction between mill town, later industrial city, and the traditional core of the larger metropolises was maintained. The tendency was for the large industrial undertakings to be sited in these satellites and factory cities, leaving to the traditional core city a vast array of smaller industries not requiring great components of power. With the shift to steam power, which came in the United States around the time of the Civil War, the necessity to carry on heavy and extensive industry away from the core was considerably reduced. The city could grow industrially, as it in fact did, sopping up much of the rapid increase in urbanization in the United States in a small number of large metropolises that were becoming workshops of a thousand productions. With the advent of steam, all a metropolis

needed were good, practicable sites for factory construction and an expanding labor force of the sort made available by massive European migration to this country. The recurring waves first of Germans, Scandinavians, English and Irish, and then of Bohemians, Poles, and other Slavs, and finally of southern Europeans provided the workers; and the great reception areas for in-migration were the now vastly grown colonial ports and river and Great Lakes entrepôts. Boston and the colonial ports of southern New England—Newburyport, Salem, Providence, New Haven, and Bridgeport—filled rapidly with a great diversity of increasingly large industrial undertakings. Some individual factories were still sited on or adjacent to the docks, where coal for steam raising and raw materials for manufacture might most cheaply be secured; where the scale of consumption of raw materials and fuel was less massive, no more than a rail connection might suffice. In the earliest phase of this burgeoning of industry in the metropolises themselves, from midcentury to perhaps the 1880s, growth was probably greatest fairly close to the core and the tenemented housing that had grown up there, which might be used to house the flood of immigrants who would help fill the industrial jobs. But with the trolley, the intra-urban transport available to the blue-collar group, industry could begin to look toward larger, and often cheaper, sites away from the traditional city.

It was at that juncture that we may begin our discussion of the geographical pattern of industry within metropolitan cities. Because Americans had been forbidden by England to engage in manufacture in colonial times, with the major exception of the production of bar iron, there was relatively little industry in cities when the American Industrial Revolution commenced in 1790. And as noted, that campaign to gain industry for this country led at first to the shaping of industrial satellites at a remove from the traditional cities. Within those cities there was, of course, some accompanying industrialization, such as shipbuilding which had to be carried on in a port, and ship fitting and repair, which had to be undertaken in working ports where such services were greatly needed. As cities grew in population and economic activity, with the development of a national economy to replace the colonial one, all sorts of initially small productions began, commonly in factories interspersed with port and wholesale functions. The advent of steam, which came before the middle of the last century, though of course it grew much more quickly after that date, made it possible to expand these many germinal manufacturing undertakings without leaving the center of the city. In cities such as Providence, there was rental steam power from some of the larger factories to the smaller firms. The multifarious productions of the ports, combined with the ingenuity fostered by need and experience, provided further factories, commonly small in the beginning but very rapidly growing if the need they filled was widely felt. The growth within individual firms as well as the increase in the number of discrete firms was such that by the time of the Civil War, industrial crowding within the older cities was increasingly felt.

The growth in scale of firms meant not only that they must look for larger space but also that they normally had reached such a size that they could afford to provide their own steam power and could attract a labor force for

which the employment provided by the firm would determine the family's residential choice. The freedom offered by these two changes was such that satellite sites might be chosen where previously only a location in the heart of the traditional core would have served. When factory operations were moved away from the center, that site was left for at least another generation to provide a seedbed for later arrivals on the industrial scene. At the same time, the increasing size of the firms that moved to the satellites meant that the large-scale incrementation to the industrial labor forces was likely to take place there. Changed market conditions can cause rapid expansion in firms employing hundreds or even thousands of workers or, in times of depression, equally rapid contraction. But as the American economy was in broad terms growing rapidly between the Civil War and World War I, the industrial satellites of large cities became one of the more important components of urbanization during that half-century.

At first the outward shift was not over any great distance; factories were constructed at or near the edge of the built-up city, but seldom far into the countryside unless controlled by some localized resource, either waterpower for electrical generation or a mineral occurrence. In the Pittsburgh region, factories were strung along the deep and winding valleys of the tributaries of the Ohio River, not because the location conditions were right in relation to Pittsburgh and its market, but instead because local coal moved on rails, normally built in the valleys, as did iron ore brought in from farther away, and water—the most voluminous component of iron- and steelmaking, as well as most forms of manufacturing—was most available there. In this situation, as in the early waterpowered textile industry around Providence and Boston, an extensive industrial region grew up, with the factories spread outward from the core city for as much as a hundred miles, but also with strong control of these factories and their operations exercised by the mercantile and financial community of the core city. Boston effectively dominated the New England textile industry down to the time of its massive shift to the South in the 1920s and 1930s, just as Pittsburgh was the center of control of the American iron and steel industry, which ranged even more widely from mines in Michigan and Minnesota to ironworks in Baltimore and Birmingham.

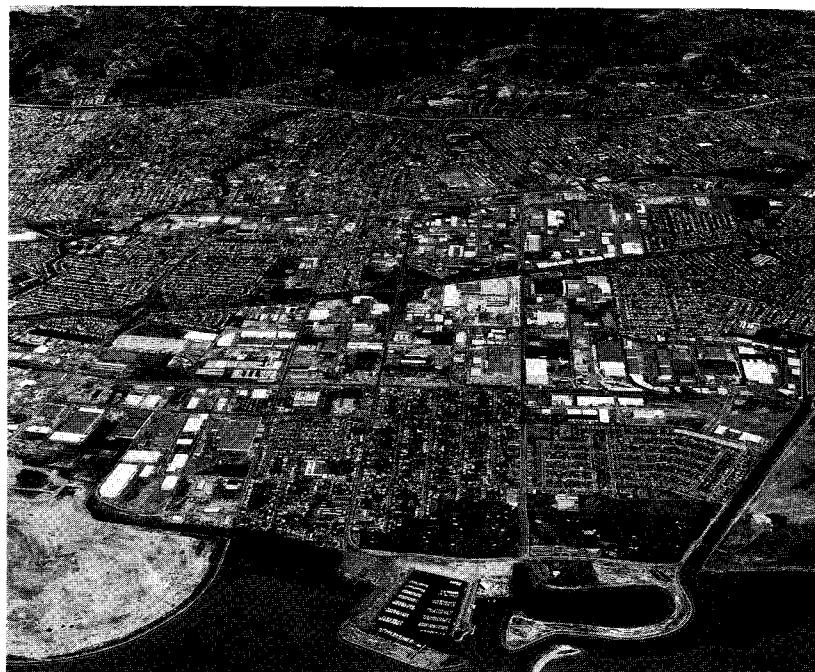
Industry proved particularly amenable to this sort of corporate conglomeration, to the extent that any discussion of the geography of industry American cities must take note of this administrative and market-establishment function. Corporate control was often all that was left within the original center of the industry after technical improvements had led to the departure of the factory activities. Boston became the center of the American woolen industry while that trade was mostly conducted in New England. Boston remains the place where the auction price of wool is largely determined, even though there is little manufacturing left in nearby satellites. In similar fashion, New York came to establish the prices and the organization of sugar refining, coffee roasting, and cotton manufacture, a role it continues even though only a relatively modest portion of the American industry is anywhere near Gotham today. Pittsburgh has this role in iron and aluminum, Chicago in grain and meat, Houston and Calgary in oil, and

Buffalo and Minneapolis in flour, even when in several instances the city is no longer the dominant or even a particularly important processor, as is the case for Chicago and the meat industry. Once a manufacturing commodity market has been established, there is a tendency for longevity, which results from the fact that in creating an auction market where prices are set, experience, availability of speculative capital, and physical proximity among the traders are essential. Chicago has demonstrated the need of all three of these attributes in the recent attempt by its Board of Trade to add to its longstanding trading in grains, pork bellies, and other agricultural products the establishment of an auction market, where prices are set on all sorts of negotiable paper such as stock options and other arcane forms of corporate remuneration.

The Advent of the Flat Factory

The decade following World War I was the time of the great shift in factory locations. The manner of growth before that time had commonly been to build taller and taller and longer and longer structures for manufacturing at or near the original location of the firm. The enormous buildings for the American Woolen Company strung along the banks of the Merrimack at Lawrence, their cotton peers at Manchester for Amoskeag, large carpet mills at Enfield Falls, Connecticut, and Amsterdam, New York, and the early car factories such as Ford at Highland Park, Michigan, were examples of this traditional giantism. Expanding trade was handled by enlargement of manufacturing facilities, at first only in the traditional way. But Henry Ford's adoption of the assembly line in 1913, to expand production of the first mass-produced car, his Model T introduced in 1908, began to change things. Although the first assembly line was installed in a multistory building at Highland Park, it soon became clear that the technology would be simplified and made less costly by the adoption of the flat factory, one on a single level where the flow of assembly could be essentially continuous. Even in firms building items far smaller and less complex than cars, there began to be an awareness that many types of manufacturing could be speeded up and cheapened by location in flat factories. But to build these at any reasonable cost, outlying sites were required. It was the rapid rise of motor transportation, both by truck and by car, that came right after World War I that supported this shift. Workers could converge on an outlying site when they drove themselves to work. Components of manufacture could be trucked in from nearby, rather than having to be produced at a distance and arrive only periodically by freight car, or else made on site, thereby further crowding the plant layout. And increasingly, trucks could be used to distribute the finished product within the urban areas and its neighboring regions. In automobile manufacture, this was the period of dispersal of assembly plants to various parts of the United States, further encouraging a new morphology of factories in what was by then America's largest industry. The rise of radio, electrical appliance (refrigerators and ranges), and several other mass-consumption industries during the 1920s lent further dynamism to the rapid shift to the flat factory on a peripheral site.

San Leandro, California, south of Oakland, became the site of a great amount of wholesaling after World War II when the flat factory or warehouse became nearly universal with the introduction of pallets and forklifts. Photo: R. L. Copeland, 1977.



That shift to the edge of the city, or at least to areas that had not as yet been divided up into blocks, came not merely because of the increase in production that was being experienced, but as well because the space per worker was growing. Data are not readily available on the space per worker before World War I, but we do know that it was smaller than even in the early 1920s. Most older industries had been highly labor-intensive, with fewer and smaller machines, thus gaining increased production mainly by crowding more workers together. Since mechanization was generally greater in America than in Europe decade for decade, and factories perhaps more generously built in a country of cheap land and cheap building materials, crowding was somewhat relieved, but still intense by modern standards. Power was universally distributed mechanically, along shafts and the belts that they moved, so pushing everything together not only increased production but also made mechanization more practicable; in mechanical transmission of power from a waterwheel or a steam engine, loss through friction was considerable and greatly increased by small elongations of the shafts and belts. The development of electricity as a source of power, through the use of dispersed small electric motors, came at the turn of the century, encouraging the greater use of machines. Those machines took up more space, even though they reduced the number of workers needed in production because the speed of machines could be greatly increased, yielding higher production per hour. In this situation it also was possible to apply power at so many separate work stations that the assembly line became possible, not only further increasing the desire for space but even determining the sort of space needed. Linearity became a critical component of production, to the point that some plants had to expand beyond the modular

The Continuing City

434

size of blocks in most American cities, which were divided almost universally into fairly regular, rectangular street blocks.

This combination of greater space needs per worker and specialized form for the emerging factories forcefully projected new industrial development out of the core of cities. What remained in those traditional sites were either small, often moribund firms surviving from the past, or productions so strapped for labor or low rents as to be encouraged to occupy less than ideal space. The aging multistory factories near the core also served as a seedbed in which fledgling industries might begin with the least financial risk. But if they succeeded, they were likely to move promptly to purpose-built factories at the periphery of the city where volume and productivity could be increased. With this ever-recurring desire to move out of the core into roomier plants, the space needs went up. In metropolitan New York it is figured that the pre-1922 plants stand on 1,040 square feet of plot space per worker, while those constructed from 1922 to the close of World War II occupy 2,000 square feet and those built during the first ten years after the war 4,550 square feet of plot space per worker.¹⁸ This trend has continued during the subsequent quarter-century, obviously much enhanced by the increasing use of robots.

By the 1920s many factory designs were so enlarged, particularly in at least one dimension, that construction within the normal grid pattern of the city was virtually impossible. And increasing dependence on self-transporting workers made large areas of employee parking essential. It became the practice to provide such parking free of charge, so firms have never been able to shift the economic cost of parking space to employees as they have done with the cost of housing since it became generalized during the first half of the nineteenth century.

The Model of the Factory before 1945

The trends of the 1920s continued in a fairly consistent fashion until World War II. Space usage continued to grow, car commuting became more nearly universal, and the creation of larger factories and more mechanization persisted. The rapid increase in the size of manufacturing operations tended to be reflected in ever-larger assemblages of factory buildings, to the extent that truly giant factory complexes, sometimes employing tens of thousands of workers, were created. The River Rouge plant of the Ford Motor Company, constructed mainly in the 1920s, was the first of these giants, but others were to follow in the automobile, locomotive, and aircraft industries. Shipyards, initially during World War I, became such mass-production facilities, though the cycles of construction were such that they tended to have surpassing booms and virtually lethal busts. All these giant industrial complexes introduced a different urban morphogenesis from the ones we have been discussing. No site short of the countryside well outside the city could be examined for new developments of the sort. These were

18. Data presented in Edgar M. Hoover and Raymond Vernon, *Anatomy of a Metropolis: The Changing Distribution of People and Jobs within the New York Metropolitan Region* (Cambridge, Mass.: Harvard University Press, 1959), p. 31.

The Emergence of the Complex City

435

factories without houses; the workers had to commute over considerable distances, with residential communities in the vicinity of the plant growing only slowly to match the jobs available. The industrial expressway had to be devised to tie these great complexes of production to the complexes of housing and business needed for the workers. The Arnold Industrial Expressway in the eastern part of the Bay Area and the Willow Run Freeway built in Detroit during World War II were such connections to deal with a situation where the scale of production required a truly detached and specialized satellite provided with workers by the existing metropolis. This seems to have been the culmination of the continuous evolution of the factory from the small workshop of mainly hand labor at the fringes of the early-republican traditional city to the integrated plant that was a geographical as well as an entrepreneurial entity. As we shall see, in the post-1945 period that integration tended to decline, but for now we may consider the pattern of industrial land use only in the pre-1945 city.

Any model of the industrial structure of the prewar city would show little survival of the original core-fringe factory area. The growth of the central shopping district, the office-financial area, and some aspects of wholesaling were normally such that the oldest factory quarter had been obliterated. Somewhat farther out along rail lines, and intermixed with surviving wholesalers' warehouses, would be found multistory factories from the first half of the hundred years we have under consideration. These tall but relatively confined buildings would be in use for the sorts of manufacture found in most cities—machine-shop operations, small metal fabrication, shaping of builders' needs, and various food-processing activities among them. By 1940 most operations with markets wider than the metropolis would have moved out of such traditional-city quarters, taking up larger units in areas that had not yet been plotted into street blocks by the time of World War I. There, mass-production facilities, with linear assembly lines and increasing use of heavy machinery, were constructed—as time passed, more commonly in single-story factory buildings and surrounded by parking lots for employees. By this time the geographical link between factory and worker housing had been sufficiently weakened that the majority of workers probably lived in fairly close proximity to the factory. The improvement of arterial roads during the superhighway era of the 1930s permitted this stretching of the still integrated fabric of the metropolitan city. The now extensive factories reached by these arterial roads were still physically contiguous to the central cities, and their workers tended to use the normal street system of the metropolis to reach their workplaces.

Throughout this evolution between the wars there had been an element that ultimately reshaped the broad urban morphology: the giant factory complex. These were never present in great numbers, but their size and the crowds of workers they gave employment to assured them great individual importance. The rapid build-up of industry in the late 1930s—the American attempt at “preparedness” for possible war—brought these huge complexes into being. The anticipated scale of production under preparedness was even insufficient for the actual needs of the early 1940s. Shipyards, tank and truck plants, airframe and airplane-engine factories, and other facilities

needed for the conduct of the first global war were at a scale never before envisaged, save in the automobile industry, where Henry Ford, that peculiarly narrow prophet, had started building his giant River Rouge plant even during World War I. The great industrial complexes of the early 1940s had to be constructed away from the built-up city and to become linked with it by industrial expressways that served the pendular movements of workers, three shifts a day during wartime conditions. No such giant plant could have been constructed save on the outskirts of a major industrial metropolis, as the tens of thousands of workers employed there could be secured and cared for only by the existing commercial, residential, and public-institutional structure of such a metropolis.

The giant exurban plant demonstrated clearly that the physical integration of the factory and the city had become elastic, functional but not necessarily confined within a continuous morphology. Just as the evolution of the factory from the upstairs workshop near the port to River Rouge, or even more Willow Run, had led to the creation of a distinct and specialized architecture for industry, the growth in the scale of manufacture, facilitated by developments in transportation, led to a new urban morphology of factories. The industrial plant had become a separate, commonly freestanding structure sited in response to a number of location forces but with little reference to either the morphology of the general metropolis or its working-class residential areas. The large scale of the industry and the great personal mobility of workers combined to allow a new level of geographical abstraction in the matter of industrial location within a broad urban region. The postwar decades have seen that this quality can cause not merely the broad movement of factory location within the urban region, but also interregional shifts in industrial location such that a new sectionalism has arisen in the United States, pitting the smokestack belt against the rest of the country.

The American Solution to Worker Housing Provision

Up to the middle of the last century, housing in American cities largely followed the medieval practice of a close association with workplaces. Within cities, those who worked in retail and wholesale establishments lived either in the buildings employed for the trade or in housing within walking distance of them. As the greater part of industry was then based on water-power, the hydraulic town or city built to develop the power potential of a fall became certainly the most characteristic location for factory-worker housing. In Waltham after 1814 the boardinghouse had sheltered the unmarried workers, and in Lowell after 1825 those with families were resident in row houses ranged closely around the mill yard. These residential facilities were frequently constructed directly by the mill owners or, if not so directly, by investors drawn commonly from the same classes. In the countryside, hydraulic cities—such as Lowell, Lawrence, Chicopee, and Holyoke in Massachusetts; Manchester, Nashua, and Rochester in New Hampshire; Saco, Lewiston, and Auburn in Maine; Amsterdam and Rochester in New York; and Paterson in New Jersey—joined residence closely with industrial development. In the emerging metropolitan areas, the industrial satellite—

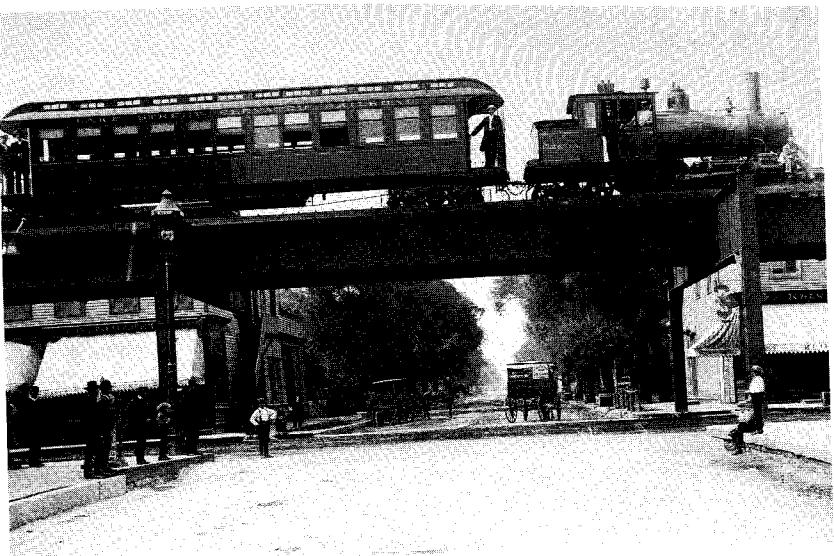
such as Pawtucket near Providence, Waltham near Boston, and Ellicott City near Baltimore—grew up with the same form of close morphological association of factory and worker housing. But practices changed after 1850, and housing was generalized within metropolitan cities as well as within the hydraulic cities. Housing thus came into existence often through the efforts of small investors constructing tenements or row and cottage houses for rental to factory workers.¹⁹ From midcentury on, city housing tended to be rental in nature and increasingly multiple-occupancy in style. As we have already seen, the tenement and the apartment took over as the typical elements of true city housing.

It was only the development of the trolley that changed that modular structure, shaping the blue-collar suburb to join the older but far smaller railroad suburb of the middle and upper classes. From around 1890 on, the sober and skilled working class could begin to aspire to these suburban houses. In the larger metropolitan cities those outlying residences might come in multifamily units—such as the three-deckers of southern New England cities, which frequently combined the flat of the owner with two for rental, ranged normally one above and the other below the owner's flat. The location of factories brought about, as well as reflected, this suburbanization of worker residence. The trolley made possible the move of the blue-collar workers to the suburbs, while at the same time the outlying residence of that group—combined with the efficiencies of the larger factory on a flatter plan—led factory owners to move their works toward the edge of the city. Up to the time of World War I this worker housing was heavily rental in nature, mainly because at that period mortgage funds were hard for blue-collar workers to obtain; they normally were given for only a modest part of the construction cost, and then for only a short period of years, six to ten, requiring sizable repayments. The small builder constructing for his own account, the modest investor seeking a stable and consistent return by having one or a few housing structures built, and the occasional worker whose family had managed to save the rather large down payment, were the main sources of this blue-collar suburban housing, leaving the main body of workers to rent these facilities.

The Rise of the Middle-Class Suburb

As long as the trolley remained the main form of transport available to working suburbanites, this physical pattern tended to be repeated with each decade's addition of housing to the metropolis. Only the middle and upper classes departed from the common pattern, both by being better able to finance their own housing and, around 1910, by taking up the nascent automobile to secure movement within the suburban band. Well-to-do suburbanites could move away from the suburban railroad stations into the countryside farther away, using cars to provide access from their houses to those outlying commuter railroad stops. The men commonly worked in the

19. For a discussion of the generalization of housing, see James E. Vance, Jr., "Housing the Worker: The Employment Linkage as a Force in Urban Structure," *Economic Geography* 42 (1966): 294–325.



The elevated began first with steam power, as shown here on the Lake Street line in Chicago in 1893. Using such relatively expensive technology meant that the first suburbs tended to be more for the middle class than for the masses. Note that the streets were unpaved, though sidewalks were, probably because those traveling had to walk from the elevated station to their homes. Photo: Chicago Elevated Railway.

traditional city, but women increasingly used cars for shopping in the clusters of shops located within the suburban band. Thus, there was a good historical background for the American development of the station wagon—licensed as a "suburban" in several states—to serve just this need, though ultimately its human milieu was broadened to include most social classes, if not all morphological components of the metropolis. With this newly introduced complexity of suburban transportation there came a further split in the economic-class structure of the band. Even before the station wagon was introduced, the very wealthy had been able to move beyond a walking radius from the commuter stations by normally having access to the horse-drawn vehicle, with a driver to operate it, to pick them up at the station at night and return them there in the morning. This transportation separation within suburbia introduced the thin belt of "estates" found even in the last half of the nineteenth century. But only with the coming of the automobile, soon to be refined into the station wagon for middle-class suburbanites, could the group able to live beyond walking distance from the outlying station increase significantly in numbers. Most of these families could not afford estates, but they could buy the roomy houses on large lots that began to fill out comfortable tree-shaded and lawn-enclosed subdivisions toward the edges of the bead-pattern towns that had grown outward from the city along the commuter lines. The number of middle-class purchasers was considerable but still sufficiently limited that the normal practice appears to have been for real estate developers to hedge their risk by engaging in subdivision of large parcels into lots, but seldom undertaking the actual construction of speculative houses on those lots. Instead, individuals bought lots and contracted with a builder to construct a house thereon for their residential occupancy. Occasionally, in the more active middle-class markets small builders would buy a few lots and then set about, serially, constructing houses for these middle-class purchasers until the subdivision had become filled with these basically individually constructed houses.

The Morphology of the Suburbs

It seems useful here to review briefly the state of housing in the suburban band at the close of World War I. The first dwellings in that band would have been remnants of earlier farm housing, few in number and frequently not conveniently located with respect to the suburban railroad stations that were developed along the rail lines constructed out of cities starting in the 1830s. Much more important as the germ for subsequent "suburbanization" (in the precise sense) were the clusters of houses built by middle- and even upper-class pioneers moving away from the city in the period when the only way to do so efficiently was to settle in one of the bead-pattern towns ranged around the railroad stops between Boston and Framingham on the Boston and Albany Railroad, Philadelphia and Paoli on the Main Line of the Pennsylvania Railroad, San Francisco and Palo Alto on the Southern Pacific Peninsula Line, and other such potentially suburban stretches of railroad. It was from these clusters of nucleated settlement at closely spaced stops within the countryside adjacent to the older cities that those seeking to build true suburban estates on larger blocks of former farm land set out for their domains. That sprinkling of large units of basically suburban residence served to push the outer edge of the metropolis well into the countryside, transforming an agricultural into an urban residential economy. These estates signaled the future by bringing in a nonagricultural service-trades population, improving the commuter rail service, and generally ripening the land for suburbanization. The blocks of land not contained in estates would, because of their proximity to high-income-class housing, tend to gain a cachet of desirable social location such that the next outward wave of suburbanization would tend to move into that quarter. Eventually, as wages were raised, most estates became too expensive to provide with servants and workers, and even the wealthy tended to trade the amenity of a handsome bank balance for that of a designedly pastoral and feudal environment. The early rail-age estate came eventually to be a bespoke housing subdivision for the middle class, a golf course, or, among the generous, a park for the ordinary folk.

The great change in the suburban pattern came when this middle- and upper-class residential morphology, with a few small inliers of blue-collar housing for those serving the needs of the prosperous—shopkeepers and their clerks, suburban town employees, servants on the estates and, in smaller numbers, in the larger middle-class houses, and others of modest means but needing to live among the prosperous—was joined by a much more massive morphology of more modest housing for the blue-collar classes. The working-class spread to the countryside came when the steam railroad was joined by the electric-car line, commonly with low and unit fares that made access to the suburban band by the working class practicable and, finally, a flood. The locale for that blue-collar in-migration was found in the bounds between the radiating railroad lines, where the countryside remained untransformed by the suburbanization that had reached land much closer to the traditional city, and in odd bits in and around the bead-pattern railroad suburbs where the land was socially or visually less attractive and

had thus been passed over by the earlier swells of middle-class suburbanization. The flood of migration along the trolley lines was so large that all morphological gaps tended to be filled with this modest suburban housing, spreading a seamless carpet of residential land use out from the traditional city. There would be the peaks of social esteem represented by the former estate districts, with slopes of some social elevation occupied by the middle class. But underlying it all would be great expanses, a plinth, of modest family housing now served by trolley lines. Because the construction of those light rail routes depended ultimately on some vague expectation of eventual profit to undertakers, there was a gentle constraint on the outward spread of the trolley wire. The "trolley city" remained a compact one; in fact, trolleys increased compaction of urban morphology because they served to fill in the gaps of previous suburbanization with patches of modest worker housing. At the close of World War I, this was the normal pattern in a North American metropolis. The quiet and calm of these suburbs belied what became a wrenching generation of suburban transformation between 1918 and 1940. That transformation was divided into two unequal periods, the first from World War I to 1934, and the second from that year to the outbreak of World War II.

Suburban Transformations after 1918

The first transformation of the pre-1918 residential provision came with the rapid decline, during the 1920s, of the trolley as a medium of intra-urban transport. It is unnecessary here to sketch in full detail the background of that decline beyond noting that throughout the early years of the trolley era (1890–1910) there was always the expectation that profits would improve once the construction phase was completed and a larger part of a railway's earnings could be dedicated to maintenance of way. In those early years receipts rose rapidly—additional lines were being added and numbers of riders were growing rapidly—so there was little careful accounting as to the actual return on the capital invested; the burgeoning money flow seemed to make such figuring unnecessary. When war broke out in Europe in 1914, goods became more expensive, as did labor once the United States approached the war. The cost of repair and even operation rose rapidly just at a time when replacement of the original infrastructure was needed. During the four years of the war the unrealistic returns on capital invested in electric traction became quite clear. It was discovered that most of the later—that is, outer-suburban—additions to urban trolley systems were not truly economic. As pressures increased in the companies, it became natural that they should first think of abandoning those outer extensions to bring fare receipts into closer approximation with operating and maintenance costs. Starting in 1918 electric-traction mileage began to decline with abandonment of lines, to the point that by the end of the 1920s many people living in the suburban band were beginning to experience difficulty in moving around that area by electric traction. The depression that began in 1929 greatly aggravated the situation, leading to further abandonment of lines and curtailment of service on those that remained in use.

This abandonment of the trolley lines hurt in two ways. The first was the obvious one of simple loss of service, such that persons living in certain parts of the suburban band were denied rapid and reliable service in intra-urban journeys. Buses were slowly substituted for most abandoned trolley lines, but their speed and comfort levels were so low that those stranded along the abandoned trolley lines commonly found it preferable to try to provide for their own suburban transportation by purchase of a car. The second painful consequence of trolley abandonment came in the matter of fares. We saw earlier in the chapter that the flat-rate nickel fare reduced the economic cost of distance within the metropolis to a low, and frequently uniform, charge. Endowed with that low cost, many lower-income families moved well out into the suburban band while still keeping their transportation costs under control. When the traction companies began to realize that their low rates could not be continued, a conclusion reached around 1917, they began to raise fares, thus creating a problem for the lower-income suburbanites. When trolley service came to be given up a decade or so later, those who replaced it with automobile commuting found quickly that the costs of living in the suburb could be high. If high fares must be paid on the remaining public transport, there seemed to be no benefit at all; the same transport that had been cheap was unchanged, yet now far more expensive. But by turning to the private automobile to provide suburban transportation, some return was gained from the increased costs in that the family would now have a car to use outside of working hours, so shopping expanded in suburban towns where prices tended to be higher than in the larger places, particularly the centers of industrial satellites now surrounded by the expanded suburban band. It is not surprising that many families opted for the car even if its total money cost might be greater per year than that for public-transit fares.

Once the automobile became democratized, a shift aided greatly by Henry Ford's mass production of the Model T such that these cars were sold in the early 1920s for as little as \$285, a new dynamic for suburban housing was in hand. Whereas until then only the fairly well-to-do could move away from fixed transit lines, now an increasing population could do so, in fact had to do so. Land that had lacked the amenities for higher-economic-class residential development could now be envisaged as potential housing sites for blue-collar families. That trend was aided by the flexibility that car transportation offered, such that several members of a family might find work, the head of the household possibly in the traditional city—reached from the end of a trolley line in the inner part of the suburban band—while older children or even the spouse might find employment within those parts of the suburban band approachable only by car. The combination of family incomes might thus make the income total gained from the collective use of a car great enough to cover its increased cost over public transport. By the late 1920s the automobile suburb was a reality in American cities, and the more than twenty million cars registered in the United States made mass housing in the suburbs as possible as it had been under control of the trolley wire. But to make the system work with increased transportation costs, it was critical to keep the rental costs of housing under stern control by assuring a

large supply of modest-price suburban housing and access to it for people not possessed of any appreciable amount of capital.

Solving the Housing Problem

The 1920s were a time of prosperity but not one when the blue-collar class had much accumulated capital. Savings were modest for that group and not particularly likely to enlarge in a time when a number of useful but relatively expensive household machines were being offered for the first time. The car was the most obvious and appealing example, but the refrigerator, radio, washing machine, electric stove, and self-feeding furnace were other important introductions that tended to appeal particularly to the servantless working classes. In the late 1920s more of the blue-collar class were able to think about buying their own houses, a need because the shift to the suburbs was notably a move from the rental residential area of the traditional city to the owner-occupied residential area of the suburbs. What made the situation particularly difficult was the high need for capital for working-class entrants to these areas. The necessity to purchase a house in order to live there, a car to survive there, and a number of household appliances to be happy there put great pressure on many families if they sought the suburban solution to the continuing housing problem. Before we take up the question of how to solve the problem of housing, we should recognize that there existed a severe constraint of capital availability for even skilled and continuously employed workers and their families. If the common practice of the higher-income groups—residence in owner-occupied, single-family, detached suburban housing—were to become a general form of housing provision in America, some effective way must be found to make increments of capital available to the many substantial workers' families seeking to move to the suburbs.

The housing problem had almost certainly always existed in cities. Rome was crowded and noisome in parts, medieval cities even more so because of their constriction within narrow walls. The rapid growth of urban population consequent upon the Commercial Revolution of the sixteenth and seventeenth centuries and the Industrial Revolution of the eighteenth and nineteenth centuries brought the matter of housing provision to national attention. Government investigations at the middle of the last century delineated the scale and urgency of the housing problem, but effective remedial action was delayed by the absence of any existing practice to deal with it. Only toward the end of the last century, and first in Bismarck's Germany, was it perceived that adequate housing was a national concern. There had been earlier rather piecemeal attempts at public housing, as for example early in the nineteenth century at Verviers in Belgium. One of the more fundamental concerns that led to the formulation of Robert Owen's initial "socialist" proposals in the 1820s was the belief that there must be governmental acceptance of responsibility for provision of adequate housing regardless of family income. As that socialist thought spread, it was taken up primarily in cities where individuals and some local governments sought a public provision of housing with charges geared to the ability to pay rather



This aerial view of Sonoma, California, shows the further transformation of a Laws-of-the-Indies town (compare with figure on page 216) during the rapid growth of automobile-based suburbanism and exurbanism after 1945. The forty-acre small holdings shown in the earlier plan of the town can still be seen in the grain of the housing tracts laid out a full century later. Photo: R. L. Copeland, 1981.

The Continuing City

444

than the amortization of the cost of the housing. This became in essence the European solution to the problem of providing adequate housing. Britain followed Germany in the late 1880s, first in London but later in most cities, and eventually even in the countryside where most agricultural housing was of a rental nature. By 1940 it was established practice in most of Western Europe that working-class housing was heavily subsidized in its construction phase. That general solution to the housing problem was worked out in a characteristic morphological context. Land tended to be narrowly held in Europe, or else so split into tiny peasant holdings that it was difficult to change. These landholding practices inhospitable to the easy spread of the city were further reinforced by the nearly universal dependence in the pre-1939 period in Europe on public transit for moving workers in the journey-to-work. Trolley lines were numerous, but because they were most commonly built and operated directly by municipal corporations, they were not distantly ramified beyond the traditional city's boundary. Working-class housing might be subsidized in its construction, but it was only so supported within a narrowly confined area, that of the municipal corporation that provided the funds and built the transit that moved ordinary people about the city. The era of widespread ownership of cars in Europe had to wait at least for the 1950s, and even later in some countries.

In North America contrasting geographical conditions seem to have induced a quite different solution to the common housing problem. There was normally a very wide ownership of rural land, and that in fairly large blocks because colonial efforts to introduce feudal landholding practices to North America had, in the main, failed. As housing pressure in the traditional city grew, the North Americans, both Canadian and American, sought urgently to use this cheap and extensive endowment of land for working-class as well as upper-income housing. There were commuter railroads at work in dispersing the more well-to-do to suburbs by the time of the Civil

War. During the generation after Appomattox, a large amount of North American ingenuity was turned toward adding a democratic component to city transportation, to be realized in the late 1880s with the phenomenally rapid spread of trolley lines. Both in Canada and in the United States, this spread was almost wholly the work of private investors, who operated under franchises to occupy the streets of a particular city. These grants might be assembled from several adjacent municipalities, so it became common in Canada and the United States for trolley systems to extend well beyond the limits of the central, traditional city, opening up large tracts of normally fairly cheap land for housing development. With the low, often unit fares charged by these North American trolley systems, the blue-collar classes could join their white-collar counterparts in seeking housing on the numerous blocks of cheap development land.

This geographical solution, contrasting with the architectural one used in Europe to solve the housing problem, created the metropolis that came to be dominated by the suburban band that emerged as the North American city. While inordinately cheap suburban transit was being provided—through an odd and generally unrecognized subsidy from private capital to families of modest income—a surprisingly large spectrum of urban people could seek the suburban solution to the housing problem. But with the collapse of that “capitalist subsidy” when electric-traction companies were forced to raise fares and curtail services during World War I, practices even more in evidence in the decade that followed, the housing problem became more difficult of solution. The widespread adoption of automobile commuting overcame the impending catastrophe resulting from the abandonment of trolley service to the outer parts of the suburban band, but it did so only at a price that began to disrupt the stability of the North American solution to the housing problem.

Turning specifically to the United States so that we may deal with its particular remedy in this disrupted housing provision, we should note that the final straw that broke what had been an entirely private, capitalist solution to the general housing problem came with the Great Depression of the 1930s. That economic debacle led to an even more rapid program of abandonment of trolley lines, and rises in fares, that put increasing financial pressure on the ordinary family in the suburbs. Their incomes tended to decline with the onset of the Depression, their costs rose with the removal of the capitalist transportation subsidy, and their own capital tended to shrink disastrously with the collapse of the stock market. The suburban housing market fell into desuetude. The American solution to the housing problem was in a shambles by the time Roosevelt assumed office in 1933.

The New Deal Revision of the American Solution to the Housing Problem

The New Deal, though at the time viewed as radical in many of its programs, proved to be part of what by 1934 was a longstanding American solution to the urban housing problem. That solution was the use of private investment applied to relatively cheap land to provide an individual house to families owning and occupying those structures. That goal in the mid-

In the years immediately after 1945 the demand for housing was extreme, and it was satisfied by two mechanisms—veterans' loans and veterans' housing tracts. This is San Leandro, California, south of Oakland (shown in the background), where cucumber and cabbage fields were rapidly transformed into tracts with houses sold for no money down and a total cost of under \$5,000. Photo: R. L. Copeland, December 21, 1947.



nineteenth century had led to the construction of rather tightly packed small houses, often in rows with party walls, and sited on rectangular blocks at the fringes of the traditional city where land, though cheaper than at the center, was still relatively expensive. The small lot grew out of that land-cost factor, whereas the small house came from the modest capital available to the working class. When the trolley arrived on the scene in the 1890s, the land provision became much more ample, so new lots grew in size and the row house was abandoned (save in a band of territory extending from around Albany in the Hudson Valley southward along that river to metropolitan New York, thence across middle New Jersey to the Delaware valley, along that stream including much of adjacent eastern Pennsylvania, between Philadelphia and Harrisburg, southward to include metropolitan Baltimore and westward in an interrupted fashion to include the cities of the Ohio valley below Pittsburgh and metropolitan St. Louis on the Mississippi, with a distant outlier in San Francisco after the Gold Rush). Trolley-era housing tended to be more open, with larger lots but not much more ample buildings, at least for the laboring classes. This was the beginning of true blue-collar suburbia, which came to cover great areas in the larger metropolises. With the forced shift to automobile commuting during the late 1920s, the land base for an even more massive provision of modest housing was in hand. What was missing was the capital to bring about its construction. After five years of the Hoover Depression, the collapse of the private housing market was nearly complete, bringing distress to those already owning houses in the suburbs and preventing much further outward movement of ordinary families.

To perpetuate the use of the largely unconscious but certainly traditional American solution to the housing problem of industrial society, the Roosevelt administration set about finding a way to amplify the capital available to those of modest income. The way found was to guarantee the repayment of mortgages taken out to cover the construction of housing. This federal guar-

antee of repayment was combined with a strong pressure to reduce the down payment, from as much as half the construction costs to a rather minor percentage, and to reduce the repayment charges by stretching out loans, from the six to ten years previously common to as much as twenty-five years, thus making purchase of housing little more expensive than the payment of rent. A final component of this New Deal housing plan was the assurance of reasonable quality in the structures built, through the establishment of basic standards of architecture and construction. As enacted in the Federal Housing Administration (FHA) legislation of 1934 and following years, FHA loans were available for new construction of lower- and middle-income housing both in single-family, owner-occupied houses and in apartment developments of moderate size. The latter provision was rather little used, so we have come to view the FHA as having brought about a major transformation of the residential structure of American cities through the addition of vast tracts of automobile suburbs. That was the way it worked out in practice, but when proposed, the legislation was seen as not taking sides between the apartment housing within the traditional core city and the single-family units at the outer edge of the suburban band. In fact, along with FHA financing went a second federal program to provide cheap loans for the repair of existing housing that had fallen into a bad state.

The ultimate dominance by the suburban rather than the traditional-city housing provision must be understood in terms of the collapse of the trolley and the rise of the automobile, not just in California as was first thought, but everywhere outside of New York City and, to a lesser degree, Chicago. The rise of the car had suggested a further transformation of the morphology of residential areas for ordinary families, but the collapse of the housing industry in 1929 had put off its realization. The availability of FHA financing starting in 1934 had allowed the change to come about. Only the relatively short time between the enactment of the New Deal's housing policy and the outbreak of war in 1939—and America's entrance in 1941—limited what became a major urban transformation to match that worked by the trolley in the 1890s. Little more than five years intervened before all nonemergency housing construction was stopped. Even so, the nature of the transformation was visible by 1940, even if the scale of change could not at that time be predicted with confidence.

Before we take up that evidence of a new kind of metropolis, it is worth noting that the New Deal also envisaged the development of publicly owned housing in the United States. This was to be in housing projects built by separate authorities in cities and rented at subsidized rents to the lowest-income groups. This represented a new departure for America. Germany in Bismarck's time, Britain in Gladstone's, and other countries of industrialized Europe had begun to provide public rental housing, often with ready acceptance thereof by the tenants and no stigma different from that of general social class. But in the United States the late adoption of public housing, only in the 1930s, and its unplanned involvement in the acculturation of recent immigrants to the city—blacks, Hispanics, and Asians mostly—produced a very stigmatized situation. To live in public housing came to be associated with permanent status in what has come to be called

the underclass, that part of American society seemingly permanently consigned to poverty, family disintegration, social disorder, the lowest occupations, and a violence bred at least in part of a sense of hopelessness. Perhaps for the remainder of the 1930s public housing was still so experimental that it had an open future, but by the post-1945 period public appraisal of that housing had become so scathing that the United States has only reluctantly engaged in further construction. Public housing in the United States has smacked of the dead end—socially, economically and morphologically—ever since.

A 1939 Model of Suburban Morphology

The emergent pattern of widely accepted housing in the United States at the entrance of this country into World War II was almost exclusively suburban. Only that eternal exception in American experience, New York City, continued to maintain the morphological practices of the past. Boston, the birthplace of the American suburb, adopted the new form virtually without dissent by the late 1930s, and most other metropolitan areas marched in the same column. For the first time there were virtually no class distinctions, save for the publicly housed underclass mentioned in the previous paragraph. The rich had been suburban for a century, the middle class for at least half that time period, and the sturdy working class at least partially so since the turn of the century. Now all marched together, if to varying destinations within the suburban band. The wealthy still tended to occupy the most attractive part of the suburban band, often on its outer fringe where the thousand-year English association of the gentry with the countryside gave automatic "class" to the morphology and its "address." The middle classes similarly tended to locate where association gave a cachet, one seemingly earned by living next to the housing of an earlier generation's social leaders. Homer Hoyt in the late 1930s discerned this tendency toward sectorial spreading, guided by class, when he wrote on his sector theory of city structure, a work commissioned in part to help guide the lending practices of the FHA program.²⁰ As the wealthy and the middle class preempted the countryside adjacent to their parents' neighborhoods, the blue-collar groups had to take what was left, which tended to be those areas with fewer natural amenities, and often in the open countryside surrounding the now embedded nineteenth-century industrial satellites. Thus, all classes were on the edge, but the specific vector from the core of the traditional city at whose pioneering edge they resided was determined largely by class divisions already established by the middle of the last century.

There is little need here to expand on the morphology of the residential areas built up even in the late 1930s for the rich and middle classes. Those areas showed little change from earlier times except in a diminution of house size. With the general rise in wages, the servant became relatively more expensive, such that even the rich had to economize a bit. And the middle classes pretty much gave up having servants. Instead, those prosperous

families turned to machines for comfort in the home. Two cars freed both spouses of geographical constraint. Electric household appliances made the wife's job generally shorter and less taxing. Without servants, however, smaller housing was in order. Seldom was the lot size reduced, but certainly by the outbreak of the war the newer houses for this class were somewhat compacted, if better supplied with bathrooms and mechanized aids to housekeeping.

The Industrialization of Housing

It was in the lower-middle-class and working-class suburbs that the major transformation of the late 1930s became most observable. The federal program of mortgage guarantees so opened the market to the masses, at least by comparison with times past, that a new form of construction could be employed. Where even as late as the 1920s the most common form of suburban development had been the subdivision of blocks of land into a plat of lots, which were then sold to individuals for their personal use or to small builders who might construct, serially, a small number of houses that would be sold over a period of time to individual purchasers, in the late 1930s the housing tract with the industrial production of houses came into wide use. The market was now larger, more clearly defined by FHA regulations—which even served to influence the architecture that was favored by lenders—and seemingly more predictable as to the rate of purchase. Given the lowering of the threshold for entrance into the suburban housing market—by the opportunity to build on cheap land afforded by the use of automobile commuting and by the reduction in down payments and the spreading out of mortgage payments afforded by FHA financing—a never-before-available mass of buyers was on hand. To keep prices down, and thus obtain or even expand that potential market, builders began experimenting with what we have come to realize was the industrialization of housing provision. Houses within a tract tended to become standardized to a single model, or at most a few, contributing that modern pejorative *tract house* to our language. The nineteenth-century technical shift, begun in the United States, away from the skilled post-and-lintel construction in wood toward the more simply built balloon frame—introduced at the beginning of the period under consideration—was changed by a further shift toward the preassembly of major components of a house. Roofing trusses, side panels, bathroom plumbing units, and kitchen cabinet groupings could all be built repetitively at a workshop or assembly yard on the building site. Eventually, whole walls were so constructed, to the point that an individual house could be assembled from these massive components in a few days with very little skilled labor. To gain the advantages of this system large tracts were desirable, and to secure those at a reasonable cost the focus of builders' attention turned toward the physical edge of the city. By the late 1930s the dispersive forces in existence in the metropolis were strong indeed; only the outbreak of war in Europe in 1939 stalled what could be seen as a major technical shift in housing construction. The course of that conflict magnified the postwar transformation, as we shall see, by further elaborating the industrial production of housing, induced by the need to construct large Army camps, shipyard

20. Homer Hoyt, *The Structure and Growth of Residential Neighborhoods in American Cities* (Washington, D.C.: Government Printing Office, 1939).

As the influx of people to cities continued to surge, ever-greater provisions in real estate developments were called into existence. By draining and regulating the tidal flow of marshes on San Francisco Bay, a "new town" of Foster City was shaped to provide housing for commuters from San Francisco (shown at top right), as well as San Francisco International Airport, the second largest employment center in the metropolitan area (middle background), and the various industries of Silicon Valley behind us. Photo: R. L. Copeland, April 21, 1978.



housing tracts, and housing projects for war industries in previously little industrialized areas. In addition, the return of general economic prosperity during the war was such that the scale of the postwar market was much greater than that possible in 1939.

The industrialization of housing shaped a new morphological component of the metropolis, the vast housing tract as a modular unit for accretion. The importance of this module lay in its very scale, one sufficient to permit the construction of a planned component of retail and service activities to care for the needs of a large population quickly introduced to what had previously been quiet rural land. The planned shopping center did not have its precise beginnings with the FHA-financed tracts. That had come in 1923 in Kansas City, when the J. C. Nichols Company had laid out a major real estate development on the southern outskirts of that city called the Country Club District. Within it was constructed a shopping cluster, Country Club Plaza, first for the service of those living in the development's apartment houses and some individual housing, but second intended to draw customers from other suburban areas to the branch department and other "downtown" stores ultimately built in the plaza. That name probably stemmed from the Nichols Company's adoption of Spanish colonial architecture, then very much the rage as a result of the Pan-Pacific Exposition in San Diego held in 1915 and built in that style. Although subsequent "plazas" in the suburban band have seldom followed Spanish colonial architecture, the generic term for an integrated shopping center in the outer portions of the suburban band has become *plaza*.

It seems appropriate at this point to leave any further discussion of tract

The Continuing City

housing and its associated land uses to the next chapter, where we shall consider postwar urban morphogenesis. The trends were established in the six years after 1934 but were held in abeyance during the course of World War II. At this point it is sufficient to take firm note of the arrival of several new morphological components of the metropolis: the housing tract, the shopping plaza, and all sorts of service and support facilities of what were in truth virtual "new towns" springing up at the edge of the metropolis. New forms of school construction, new types of industry and office buildings, and many features of modern America grew out of this first major transformation of the housing structure to be introduced since the early nineteenth-century shaping of the American suburb.

The Transformation of Roads to Cope with Automobile Commuting: The Superhighway

It seems that the road has been with us since the beginning of human settlement, as of course it has in a very basic sense. But until the beginning of this century, most of those roads were earth roads, the natural surface of the ground little more than cleared of brush, trees, and stones. Even in cities most streets were earth, the more important ones perhaps graveled, and a truly minute mileage was paved with stone or wooden blocks. It is only in this century that city streets have been consistently paved with asphalt or cement. Even that paving was normally merely a coating of the earlier surface, with little or no reengineering of the alignment, grade, or width. With the advent of the automobile, the pressure for extending pavements, first felt in the 1880s with the rise of the use of safety bicycles, increased, but the emphasis continued to be mostly on spreading the hard surface rather than on creating roads for modern mass automobile movement.

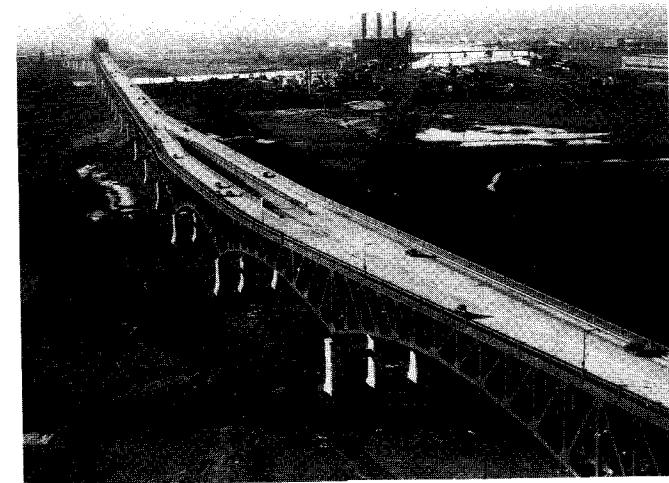
The wrenching shift from trolleys to private automobiles, which came in the 1920s, led to a rapid extension of hard-surface roads so that by around 1930 road improvement could turn to examine the nature of the route beyond the matter of its simple surface. As the 1920s wore on, the increasing use of cars for commuting and for recreational driving began to create traffic jams, which led in turn to calls for enlarging roads so that a greater and faster flow of traffic might be obtained. It was early in that last prewar decade that the proposal for superhighways was advanced in earnest. By then it was appreciated that two driving conditions created much of the congestion being felt: the conflict of cars and trucks operating on two-lane highways of necessity or choice at differing speeds, with the slowest holding up the fastest if any great amount of oncoming traffic made passing impossible; and the conflict of two streams of traffic where major roads and highways intersected. To overcome the first conflict the multilane highway, dangerously three or more wisely four lanes, was designed so that there might be two, later three, lanes of traffic moving in the same direction but at varying speeds. To overcome the conflict of crossing traffic streams, the grade separation was devised, carrying one over the other so that free flow on both might take place simultaneously. To transfer traffic from open road to its intersecting route, the cloverleaf junction was devised, first in New Jersey but rapidly put in use in

Massachusetts and California. In Britain "gyratory traffic control," the rotary circle in America, was fervently adopted in the attempt to solve this conflict at intersections, but virtually no non-Briton finds these "roundabouts" an effective solution to the problem.

Whatever specific features of traffic engineering were used, their intent was to enlarge the capacity of designated roads to deal with a rapidly increasing demand posed by the democratic adoption of the car. In cities this became a particular problem, for congestion was not merely a weekend or seasonal phenomenon; it came about every working day because the common roads of the past could not care for the volumes of traffic introduced by daily mass use of cars in a densely built-up area. The need for the creation of an automobile-era highway system was first felt within metropolitan areas and in the penumbra of rural territory surrounding them, which was subject to frequent city-based journeys. And it was there that virtually all the effective changes worked before World War II were to be found. Even as late as 1939, in a government report called *Toll Roads and Free Roads*, which contained the first national traffic count, it was shown that only fairly close to large cities, or intermediate between two sizable cities located near one another, could superhighways be justified under contemporary thinking.²¹ As Franklin Roosevelt noted in his summary of the recommendations, this report "shows that there is a need for superhighways, but makes clear that this need exists only where there is congestion on the existing roads, and mainly in metropolitan areas. Improved facilities, needed for the solution of city street congestion, are shown to occupy a fundamental place in the general replanning of cities." Thus, when we consider the birth of the automobile road, we must do so in the urban region.

Two problem situations emerged beginning in the early 1930s. The first came from the clogging of arterial roads leading to and from cities and the outer edge of the suburban band; the second lay beyond that boundary and prevailed for the distance outward that daily traffic converging on the city remained dense or weekend and holiday traffic spreading out of the city overtaxed the normal rural road system. The first situation arose from daily commuting and the intracity movement of trucks; the second from those coming from outside to the metropolis or from the traditional core to the surrounding countryside. It was in the heavily urbanized Northeast that the arterial street and highway problem was first attacked. This region had been the site of an extensive system of toll turnpikes constructed in the early nineteenth century, just before the coming of the railroad, intended to facilitate transportation between the colonial ports and their economically developing hinterlands. Much of southern New England, New Jersey, eastern Pennsylvania, Maryland, and Virginia east of the Blue Ridge were served by these straight and newly located roads. Their virtual abandonment once the railroad arrived in the period between 1830 and 1850 meant that these now toll-less turnpikes were frequently direct in course but so little used that they had not been constrained by roadside development. They might be widened to three or four lanes without excessive land-taking costs.

21. *Toll Roads and Free Roads*. Message from the President of the United States to Congress, April 27, 1939 (Washington, D.C.: Government Printing Office, 1939), 132 pp.



The Newburyport and Worcester turnpikes in Massachusetts were rebuilt in the early 1930s as a new form of superhighway, four lanes in width throughout most of their length, with a separation of opposing traffic flows by median strips, and with grade separations where designated arterial routes intersected them. In Rhode Island, Connecticut, southern New York, New Jersey, and on southward to Washington, these enlarged roads came into being and were rapidly filled with traffic, proving the point that improved facilities seemed to generate a use larger than what had preceded them. The environs of Chicago, Detroit, Los Angeles, and Oakland-San Francisco witnessed similar superhighway construction, but without the early-nineteenth-century turnpike relics to locate them.

The impact of this construction was quickly felt in the cities from which they extended. Motor trucking was considerably speeded up, thereby made more economical, and under those circumstances greatly expanded in use. Factories could be moved farther out of the traditional core or even away from the metropolis itself but still have rapid access to the city for securing raw materials and ultimately for the sale of their product. Wholesaling was fundamentally transformed, at least in its more innovative components, by making its final break from the core of the traditional city, moving often to the edge of the metropolis where the geographical approximation of rail facilities for receipts from manufacturers and arterial superhighways for shipments to retail customers was easiest to obtain. And these superhighways unclogged and speeded up the journey-to-work to the city core and to other employment in the suburban band and its embedded industrial satellites, thus encouraging additional and more distant suburban commuting. In this context the large tracts of FHA-style housing on cheap land at the edge of the metropolis became both possible and popular where superhighways radiated from the core.

Although the superhighways were relatively few in number, they did begin to shape a new urban morphology—as had the railroads in the 1850s and the electric-traction lines at the end of the century. The rudiments of the automobile era were in place by 1940, and the signs could be read. But the cessation of construction other than for wartime needs froze those signs for a

The Pulaski Skyway in New Jersey, built to connect to the Holland Tunnel to Manhattan, was constructed in the early 1930s. It was intended to provide for the traffic flow—then perceived as extremely heavy—from the industrial areas of north-eastern New Jersey (background). This elevated highway had limited access but not yet the lane separation that came soon to superhighways. Photo: New Jersey Highway Department.

period long enough to transform the scale of their ultimate implementation, but not the form.

The other problem, that found beyond the metropolitan boundary caused by conflux on the city from elsewhere and an afflux of city people seeking recreation in the countryside, also received attention. The urge for getting out of the city for recreation was already appreciated in the last century. Frederick Law Olmsted, that patristic figure in the American suburban revolution, in the 1880s had devised an elaborate system of carriage roads in a girdle surrounding Boston. He accomplished similar massive structures for recreational movement within metropolitan Chicago and Kansas City. The Westchester County suburbs of New York City came also to be threaded by parkways constructed for the early car recreation at the time of World War I. In the late 1930s that Westchester system was being extended northward in the ten-mile strip of the Empire State lying east of the Hudson and in adjacent Connecticut, where the Merritt Parkway, opened in the late 1930s, became the showpiece of recreational highway construction—partly for its engineering, which carried the superhighway to its logical development as the totally limited-access highway, and partly for its imposition of tolls to pay for it all. That seemingly easy way to gain the latest form of automobile road through the collection of user tolls was also employed on the first longer-distance automobile road to be opened, the toll turnpike from King of Prussia just west of Philadelphia to Irwin just east of Pittsburgh completed in 1940. The latter was more a truck than a recreation road, but it, along with the all-automobile Westchester and Merritt parkways, formed a model of the highway of the future, one that had to wait for nearly a decade to gain reasonably widespread recognition.

At this same period in the late 1930s Los Angeles was similarly becoming clogged by daily traffic. To deal with that situation the California Highway Department planned and constructed an urban arterial, fully grade-separated, and with limited access and multiple lanes divided by direction of flow. But unlike the situation in the East, the Golden State had dedicated all its user taxation derived from motor vehicles to highway expenditures. Thus, the Arroyo Seco urban highway became the first freeway, both because of the unrestricted flow of vehicles and because of the absence of any toll on the route between downtown Los Angeles and Pasadena. Like all other pioneering automotive roads of the late 1930s, the Arroyo Seco Freeway remained the only freeway until well after 1945 when civilian construction could resume. Only in quite specialized circumstances, as in the Willow Run Industrial Freeway built from Detroit westward to the vast Willow Run defense plant, constructed during World War II, was the model copied until peace returned.

Morphogenesis of the American City in the Industrial Era

During the hundred years that ended with the American entry into World War II the relative balance among the three major morphological components of the American metropolis shifted strikingly. At the middle of the last century the core city, what I have here called the traditional city, was

strongly dominant, housing most of the population in the urban area, then hardly a metropolis as we now use the term. The traditional city was one that grew up largely within the control of pedestrian movement, in the journey-to-work and other repeating urban movements. Beyond the limit so imposed lay only a few nuclei of settlement, those around waterpower sites where industrial satellites had come into existence and those strung as beads of suburban residence along the inner reaches of the railroad converging on the traditional city. These nuclei formed the base on which, during a century, the vast suburban band of the modern metropolis was shaped and filled out to become a massive and continuous city of great morphological complexity. Most of the growth came in the residential dispersion to this band, leaving the traditional city as the home for a few very wealthy and a great mass of recent arrivals in the city, as yet not fully acculturated and economically almost an underclass. Until the time of World War I it was mostly housing that filled out the emerging suburban band, but after 1918 both industry and wholesaling increasingly became located in the parts of the suburban band best served by extrametropolitan transportation routes, rail and then road. With that outward shift of employment opportunities, the earlier separation of residential from workplace functions in the suburban band began to become less distinct. No longer was the dichotomy between industrial satellite and suburb so precise; the arrival of the automobile as a means of commuting meant not only that suburban dwellers might seek employment in other than the closely adjacent satellite or the central city, but also that those suburbanites might seek employment anywhere within the metropolis, in the traditional core, any satellite, or even in previously entirely residential suburbs, some of which were becoming modestly sprinkled with factories, warehouses, and shops.

The trolley had spread the fabric of the traditional city, making it larger both by additions and by the stretching out of the initial fabric. The car and the truck changed its nature, leading to a rapid relocation of many previously central functions to new sites within the suburban band. Industry began to leave the city, taking jobs with it. Wholesaling perhaps even more distinctly turned away from its traditional core sites. And in the suburbs themselves changes were coming in the dependence on particular shopping facilities. The central business district maintained itself, but the seeds of change were seen in the rise of specialty shopping facilities within the suburban band. That rise came more quickly when the FHA programs were initiated in 1934, bringing a socially wider spectrum of residents to the suburbs. The numbers of potential suburbanites grew rapidly, and only the onset of World War II slowed down the pace of change.

World War II was not so long as to obliterate the strong trends of the late 1930s, but it was total enough to assure that once normal growth and expansion of the metropolis resumed, it would do so with a clear break from the past. For that reason it seems best here to close the century of the industrial metropolis and to pick up its successor in the next chapter. That successor was certainly not a nonindustrial one, but by comparison with the metropolis that evolved between 1845 and 1945 it was a far more comprehensive city with a far more complex morphogenesis.