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STATUS OF RESEARCH IN AMERICAN GEOGRAPHY

*One of a series of ten reports prepared by
Committees of the Division of Geology and
Geography, National Research Council, under
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URBAN GEOGRAPHY

**Harold M. Mayer,
Chairman**

**DIVISION OF GEOLOGY AND GEOGRAPHY
NATIONAL RESEARCH COUNCIL
WASHINGTON, D. C.**

1962

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This is one of ten reports prepared to evaluate and
describe the current status and future potential of
research in various fields of American Geography.
The coordinators of the study were Preston E. James
and Clarence F. Jones.

National Academy of Sciences - National Research Council

Washington, D. C.

1953

URBAN GEOGRAPHY[#]

An increasing number of geographers have, in recent years, been undertaking the study of urban areas as their major field of specialization. Urban geography may now be regarded as a distinct topical field of geography, with many practical applications in city planning, public administration, marketing and other activities, to which urban geographers are contributing increasingly important concepts. The distinctive focus of urban geography is in the associations of human activities in urban areas, which are expressed in characteristic complexes of land use features. The center of interest of urban geography is in the interpretation of the patterns of activities and land uses that exist within and between urban areas on the one hand, and the relationships between urban areas and the non-urban areas which they serve, on the other.

Urban geography may be considered to be a branch of the geography of settlement, on the one hand, and a branch of economic geography on the other, both of which are the subjects of separate chapters in this volume.

As in the study of other forms of settlement, some students of urban geography are primarily concerned with morphology, some with function and others with genesis (see chapter on settlement geography). Genetic studies of urban settlements, as with other types of settlements, are concerned with the origin of the settlement in terms of its physical, social and economic context; the interplay of evolutionary forces upon the growth, development, form and functions of the settlement and its changing role as an areal focus.

The committee which prepared this chapter is as follows: R. E. Dickenson, C. D. Harris, P. E. James, C. F. Jones, C. F. Kohn, H. M. Mayer, Chairman; R. E. Murphy, V. Roterus, and E. L. Ullman.

(sequent occupance). Functional studies of urban settlements generally are concerned with urban agglomerations as a whole in relation to the areas they serve, or with portions of cities selected either areally or in terms of individual land use types, or of all three. Many such studies are made by students of other disciplines than geography; notably by sociologists, land economists, and city planners. Some of the basic concepts of urban geography have been developed partly within the framework of other disciplines; yet the particular orientation of the geographer toward the complex of associations within an area has enabled him to cultivate a distinctive viewpoint toward the expanding field of urbanism.

HISTORY OF URBAN STUDIES

Analysis and interpretation of cities by both European and American geographers is largely a product of the twentieth century. Studies of the location and distribution of urban settlements were published in Germany at the turn of the century by Ratzel, Richtofen and Hettner, and in Britain by Chisholm. Methods of studying the internal pattern (layout) of cities and the treatment of cities as part of the landscape were developed by Schluter in 1899. A few years later, Hettner posed the problem of the economic support of cities, particularly of ports. The first general urban geography was published by Hasset in 1907 and subsequent papers did much to define the scope and methodology of urban geography in Germany. A large number of studies of individual cities has since appeared on the continent, among which, the studies of Blanchard of Grenoble and Bobak of Innsbruck are outstanding.

In the early development of urban geography in the United States, physical sites of individual cities received particular attention /1,2/.

The nature of the underlying rocks, soils, and water in relation to building construction, underground installations, subway construction, canals, and layout of cemeteries have all been studied. The emphasis, in urban geography as in other branches of the discipline,, was upon environmental determinism.

More recently the kinetic relations of cities and tributary areas have been analyzed, although important works in this field of research have been contributed in large part by persons not identified professionally as geographers. These studies have been concerned with areas of supply for cities, with commuting, and with areas which the city services. Leipman /3/ in England and Breese /4/ in Chicago analyzed commuting patterns of large cities. Dickinson has done much to advance the concept of the relations of the city to its tributary area /5/.

Several geographers and others have been concerned with the development of empirical principles relative to the general distribution of cities. Notable among them has been Christaller in Germany /6/. His work has stimulated studies by Ullman /7/ and other in the United States. Work has also been initiated by a geographer on empirical principles with respect to changes in intra-urban phenomena attendant upon population growth or lack of such growth /8/.

European studies on the historical origins and development of cities generally differ from American studies because of the longer and more complex development of the former. For example, European concern with street patterns and urban house types has stimulated relatively little similar work in America, for most American house types are much less complex than in Europe. The study of American urban settlements would appear to be less difficult than in Europe, since there is no long and obscure past to explore. To offset this

brief development, American settlements are in a greater state of flux, with less stability of form and function.

MAJOR CONCEPTS IN THE FIELD OF URBAN GEOGRAPHY

Many methods have been devised for defining urban settlements. Definition in terms of political organization and jurisdictional boundaries are useful for many purposes, but, except for some aspects of political geography, are geographically unsatisfactory because the municipal boundaries and the functional boundaries of a city rarely coincide. The delimitations of cities in terms of population also present disadvantages to the geographer. Effective in 1947, the U. S. Census defined Standard Metropolitan Areas to include the central city together with whole adjacent counties (towns in New England) which are urban in function to a significant degree and which contain dense agglomerations of population /9/. The 1950 census has delimited urbanized areas to include the central city and contiguous and surrounding areas having a population density of over a fixed lower limit /10/. For the geographer, the most significant criterion for the definition of an urban as opposed to the non-urban agglomeration is the function which the agglomeration performs for the areas outside of its own limits.

Several classifications of cities in terms of functions have been developed within the past decade by American geographers. Harris and Ullman, /11/ for example, have classified cities as: 1) central places performing comprehensive services for areas outside of the central city; 2) transport cities performing break-of-bulk and allied services along transport routes, supported by areas which may be remote in distance but close in connection because of the city's strategic location on transport routes; and 3) specialized-function cities performing one service such as mining,

manufacturing, recreation, education, or administration. It is obvious that these categories are not mutually exclusive. Manufacturing cities, for example, may owe their importance to a strategic location on transport routes which facilitate the assembly of raw materials and labor and the marketing of products. All functions, moreover, are likely to be present at least in some degree in every city.

Using the statistics of the U. S. Census, which gives the occupations of all gainfully employed persons, Harris /12/ developed a classification of United States cities based upon the relative proportions of the employed workers in the metropolitan areas engaged in the respective activities. The categories are: manufacturing, retail, diversified, wholesale, transportation, mining, university, and resort and retirement cities. Manufacturing cities were further subdivided into two categories, in one of which manufacturing constitutes a very large proportion of the total activities. This classification has the advantage of being based upon the entire metropolitan area, thereby eliminating discrepancies due to the reporting of occupations at place of residence of the workers rather than at place of work, since there is very little commuting across metropolitan area boundaries. The classification has the further advantage of permitting the use of a single source of statistics with uniform definitions of occupation; but it has the important disadvantage of not using uniform limits in terms of number of persons engaged in a given occupation. Although Harris' application of his classification was to metropolitan areas, it can be used for any area.

Supporting and Tributary Areas

Fundamental to the understanding of the location and distribution of

Urban -

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cities is the delimitation of the city's supporting and tributary areas, the city-region. This task requires careful economic-geographic sampling. Chamber of Commerce information is generally erroneous and grandiose. A variety of criteria based on interviews, local documents, and scattered statistical sources must be employed. They include delimitation of newspaper circulation, generally available quantitatively; wholesale trade, broken down into several representative items such as grocery, produce, milk, meat, drugs, or hardware and generally obtained most easily by sample interviews with merchants near the borders of the trade area; distribution of charge accounts, sales, credit ratings; and an infinite variety of other trade area measures depending on the local availability of data. In addition it is necessary to investigate the sources of raw materials and markets for industries, origin and destination of shipments for ports, traffic flow on highways, and by other means of transport. Each activity will have a separate tributary area, but groups of tributary boundaries generally will fall in a zone or boundary girdle so that the supporting areas of a city can be narrowed down to a few well-defined areas of graduated importance. Appraising quantitatively the relative contribution of each is difficult; but it can be done in terms of the weight of goods moved. Another measure might be the relative contribution of the surrounding areas to the basic employment of the city.

Lacking such quantitative and mappable measures of a tributary area as traffic flow or employment pattern, less quantitative but still adequate criteria can be found. It is necessary to assess the role of transportation, of barriers and magnets such as mountains, swamps, mineral deposits, or fertile agricultural areas, both in relation to their present and past

effects. The tributary area can be delimited by inference.

Site and Situation

In urban studies the area relations of a city are commonly studied at two different scales. The relation of the city and its internal pattern to the local conditions of the terrain is analyzed; and the relation of the city to the broader features of the region is presented. The former is known as the site, the latter the situation. The meaning of site and situation must be examined historically, for it may change radically even in a short time, with changing functions of the city, or changes in the technology of transport.

Distribution of Cities

Emerging from the analysis of location of individual cities are some generalizations, empirical formulae and deductive theories on the distribution and location of cities in general.

Christaller has developed a theoretical formula to account for the location and size of central place cities. As a working hypothesis one assumes that, other things being equal, the larger the city, the larger its tributary area. Thus, there should be cities of varying size ranging from a small hamlet performing a few simple functions for a small contiguous area, up to a large city with a large tributary area composed of the service areas of many smaller towns and providing more complex services, such as wholesaling, large-scale banking, specialized retailing, and the like. Services performed purely for a surrounding area are termed by Christaller "central functions," and the settlements performing them "central places." An industry using raw materials imported from outside the local region and

shipping its products out of the local area would not constitute a central service. Each central place, if unique, would have a circular tributary area, and the city would be in the center. However, if three or more tangent circles are inscribed in an area, unserved spaces will exist; the best theoretical shapes are hexagons, the closest geometrical figures to circles which will completely fill the area.

Christaller has recognized typical-size settlements, computed their average population, distance apart, and the size and population of their tributary areas in accordance with his hexagonal theory. He postulates that the number of places will follow a norm from largest to smallest in the following order: 1:2:6:18:54, etc. These figures were adopted on the basis of observations in South Germany, but Christaller believes them to be typical for most of Germany and Western Europe. The settlements are classified on the basis of spacing each larger unit in a hexagon of next-order size, so that the distance between similar centers in the table above increases by the $\sqrt{3}$ over the preceding small category. The initial distance figure of 7 km. between the smallest centers is chosen because 4-5 km., approximately the distance one can walk in one hour, is claimed (without proof) as a normal service-area limit for these smallest centers. Thus, in a hexagonal scheme, these centers are about 7 km. apart. Christaller's maps indicate that such centers may be spaced close to this norm in South Germany. Few areas seem to show precisely Christaller's hexagonal spacing, although some give evidence of such an arrangement.

Bogue, in a recent study, states that one can generally come close to obtaining 12 routes or spokes out of a city /13/. This hardly seems reasonable for small and large cities alike. Perhaps the observation is significant,

however, because Bogue was unaware of Christaller's scheme which would also give 12 routes for any large city as a corollary of hexagonal arrangement. The fact that little evidence is available to prove or disprove Christaller's theory does not necessarily invalidate the rule, because, as Christaller recognizes, transport lines tend to create tributary areas at right angles to the lines and industrial concentration on mineral resources and the like is widespread.

Other theories relating to spacing of settlements recognize a theoretical uniformity of spacing but unfortunately not in the same ratio as Christaller. The so-called "Rank-Size" rule simply states that the population of the largest city in a large, relatively self-contained unit such as the United States, is essentially equal to the population of other cities in the unit when multiplied by their rank in the country /14/. Thus double the population of Chicago or three times the population of Philadelphia is approximately equal to that of New York. The rule seems to hold also for Europe or the British Empire, but not for individual European countries. The rule does not conform to Christaller's theoretical order, and it is difficult to assess its meaning, if any. Jefferson had anticipated the ranksize rule in his "Law of the Primate City" which held that the largest cities tend to enhance their primate importance /15/.

Another formula is the so-called $\frac{P_1 P_2}{d}$ (or $\frac{PO}{d}$), which states that the relations between two phenomena, in this case City 1 (P_1) and City 2 (P_2), are directly proportional to their size and inversely proportional to their distance apart. In general terms this appears reasonable, and it has been demonstrated by Zipf, Stewart, and others by a variety of quantitative measures of the interchange of such items as railway express or long distance

phone calls between cities /16/. As a basis for a general theory of distribution it has one fatal flaw. We know for example, that the relations between two cities, A and B, will not be the same if a larger city, C, lies between them. In reality, one always obtains a condition of greater or lesser influences from a variety of directions.

In spite of the disagreements in detail between these formulae they warrant further research. There may be geometric regularities, modified, of course, in particular places, but which geographers should not neglect. What is needed are some theories of the "middle range," identifying regularities which are associated with certain cultural-physical complexes. The time is not yet ripe for a universal generalization, such as either the environmental determinism popular at the end of the 19th Century, or the newer mathematical abstractions. Herein lies a challenge to geography which should be embraced. The nature of geography lends itself to such analysis just as much as many other natural and social sciences which are experimenting with an analogous approach.

The Economic Base of Cities

Cities exist primarily to process, trade and distribute goods and services for the population of areas outside their own borders, which constitute their hinterlands. The measurement of a city's economic base is an important phase of urban geography, although until recently most methods of measuring it have been developed by economists rather than geographers.

Homer Hoyt has developed a two-fold classification of urban functions as basic and non-basic /17/. The basic functions are those which serve the areas outside of the respective cities or metropolitan areas; the non-basic

functions are those which serve the inhabitants of the respective cities or metropolitan areas. The extent to which a given activity is basic may be measured by comparing the ratio of persons engaged in that activity in the city or metropolitan area to total population of the city or area with the ratio of persons engaged in the same activity in a larger area, such as the nation, to the total population of the larger area. Thus, for example, if a given activity employs fifteen per cent of the population of a metropolitan area, as compared to five per cent of the population of the nation engaged in a similar activity, that activity is basic to the economy of the city to the extent of two out of every three persons are engaged in it, the third presumably being engaged in supplying the needs of the inhabitants of the city or metropolitan area itself.

This technique has been applied to the analysis of the economic base of many American cities including New York, Cincinnati /18/, and Philadelphia /19/, as well as smaller cities such as Orlando, Florida, and Brockton, Massachusetts, and suburbs and satellite cities within large metropolitan areas such as Jersey City, New Jersey, and Evanston, Illinois.

The same general technique may be used to determine the extent to which various activities are under-represented in proportion to the population and labor force and in relation to other comparable cities. This information may be used as a guide to the promotion of economic expansion in a locality, taking into consideration, of course, the available resources. Cities have also been classified as to the seasonality of their livelihood base /20/.

Internal Forms and Patterns

As the increasingly complex sources of support for cities have been

reflected in expansion of urban areas, the internal forms and patterns have also become increasingly complex. Until the Industrial Revolution, cities were small and highly concentrated. Within their boundaries, commonly defined by walls, structures and land uses were relatively undifferentiated. Businesses and residences were commonly in the same structure, and except for market places or public squares and a few focal points represented by cathedrals, churches, and administrative buildings, there was little to distinguish one section of a city from another, although these few focal points might be considered the genesis of the modern central business district.

With industrialization and increased specialization, it no longer was possible to carry on the urban functions without separation of places of work from places of residence; and as cities expanded the separation generally tended to become more marked.

Several generalized concepts of city structure have been developed in recent decades. The three principal generalizations are: 1) the concentric circle, or zonal theory; 2) the wedge or sector theory; and 3) the multiple-nuclei theory. The concentric circle or zonal theory of urban growth and structure, developed largely by the University of Chicago sociologists, notably Burgess [21], was an adaptation of the earlier descriptions of Von Thunen who, a century ago, described what he recognized as roughly concentric land use zones around certain German cities.

According to the Burgess concentric zonal hypothesis the central business district is the core of the city around which the respective zones may be found in the following order: 1) a zone of warehousing and light manufacturing; 2) a transition zone, within which are the blighted areas where commercial and industrial uses encroach upon the residential; 3) a zone of working-

men's middle-grade homes; 4) a zone of better residences; and 5) a commuter's zone, beyond which is the non-urban zone. The development of each zone is characterized by a succession of land uses expanding from each successive inner zone as the city grows. Thus, the high-grade residential areas on the urban periphery gradually become middle-grade, and eventually deteriorate, become blighted areas, perhaps later to be replaced by the expansion of the inner warehousing and light manufacturing zone, and in some cases even by the expanding central business district.

The concentric zone theory of urban structure and growth, it is now realized, did not consider the role of the site itself in relation to urban growth. It did not adequately consider relief, drainage, or soil conditions which exist within the urban area itself, and neglected the relative "pulls" in various directions of the hinterland and of lines of transport which distort the idealized pattern of zones.

The wedge or sector theory, pioneered by Hurd and developed by Homer Hoyt [22], describes cities as a series of sectors or wedges extending outward from the core of the city, each wedge being characterized by one type of land use, or by residential development with one characteristic, such as high rent. This theory, developed as a result of the study of detailed real property surveys of hundreds of American cities, especially stressed the variations in residential quality and rent. According to the theory, growth tends to proceed from any point of origin along transportation routes and toward other existing nuclei. The settlement tends to progress toward high ground which is free from floods and atmospheric pollution and which has scenic interest. It tends to avoid "dead-end" directions, in which growth is limited by natural or artificial barriers. The highest density of development is

along wedges which are served by the best transportation routes, while the high-class residential areas tend to occupy those wedges favored by water-front and other unusual features which tend to place a premium value upon the land. Once started in a particular direction, urban growth tends to retain similar characteristics as it proceeds outward along the wedge. The resultant urban form is often that of a star or diamond, depending on number of arterials. The number of points equal the number of access routes. Protuberances and highest density development take place along the main transportation lines which radiate from the city.

The multiple-nuclei theory describes cities as a series of nuclei /23/, each of which is characterized by an activity or group of related activities requiring specialized facilities best provided by the sites and locations which they occupy. Land economists regard the development of the urban pattern as the result of competition for sites, those uses best adapted to particular sites being able to outbid other uses /24/. The result is a stratification of land uses, those best able to afford a particular site being closest to it, and with a hierarchy of uses in descending order of rent-paying ability with increasing distance from the nucleus. Thus, the central business district, retail, administrative, and entertainment functions, depending upon convergence of transportation and thus accessibility to the maximum number of people, tend to cluster about the points of maximum accessibility, while industrial areas tend to develop along navigable waterways and railway lines. Residential areas develop between the industrial strips, which in turn are localized by the railways, with the highest densities along passenger transit routes.

All three of these hypotheses of urban development depict the growth of

cities as a gradual expansion of functional areas from the center toward the periphery. This expansion, and hence the size and form of a city at any given time, may be regarded as the resultant of two opposing forces: the centrifugal or outward force and the centripetal or centralizing force. Each of these, in turn, results from two sets of conditions: the centrifugal force is derived from the attractions of the periphery and the repulsion from the central area of cities; and the centripetal force is derived from the convenience of proximity to the central areas, and the inconvenience of distance to the periphery /25/.

Concepts of Urban Growth

The process of urban expansion has been described by a number of American geographers and others /26, 27, 28/. Originally, urban areas were confined to a size at which all parts of the city were easily accessible by animal power. With the advent of suburban service on steam railroads in the latter half of the nineteenth century, suburban clusters developed around the railroad stations. Thus, the larger urban areas took a stellate or lobate shape, with protuberances along the axes of the radiating railroad lines, but with nuclei of denser development centering on the railroad stations, like beads on a string. With the growth of suburban and interurban electric railways, between 1890 and 1920, the areas between the earlier suburban nuclei filled in, for the electric car could stop at any point, and the vicinities of the railroad stations no longer monopolized accessibility. At the same time, the cable car and the electric street railway systems developed within the cities, and along their routes the density of population increased. The multi-family apartment building became prominent along the main transpor-

tation routes in many cities. With these improvements in the technology of intra-city transportation, cities were freed from the limitations of animal power, and they expanded rapidly. The areas along common-carrier transportation routes remained at a premium, and the density gradations away from such routes were very sharp /29/.

The automobile, bus, motor truck, and modern highways enabled cities to throw off the shackles of the steel rails, and the period since World War I was marked by an accelerated rate of urban expansion, particularly on the fringes of the cities, and in the interstitial areas between the radiating prongs of earlier growth. Both dormitory suburbs and industrial satellite communities within the metropolitan areas shared in the expansion. As the central city grew, it absorbed many of the older nuclei in the outlying areas, which now remain as clusters of higher-density older development surrounded by more modern, lower-density development.

On the fringes of many cities are extensive areas of "dead land," resulting from premature subdivision /30/. These subdivided areas, often with improved streets and with public utilities installed, could not be absorbed in productive urban uses, and at the same time their potentialities for rural-type uses were destroyed. In most instances, these areas are chronically tax-delinquent, and commonly the original owners have abandoned them, creating a pattern of obsolete platted small lots, with obscure titles, making re-assembly and replatting extremely difficult. In such areas, building has either not begun or has ceased before the areas were fully developed. Occasionally they have become urban-fringe slums, particularly common in smaller cities. Subsequent new development has by-passed such areas for other land farther out from the urban centers, where problems of land

assembly, tax-delinquency, and obsolete platting are not as acute. The result is evidenced in a series of "holes" interrupting the continuity of urban development, and creating serious financial problems for municipalities by the necessity of payment of interest on cost of original improvements in the areas maintenance of excessive mileages of streets and utilities through areas producing little or no revenue, costs of fire and police protection in extremely low-density areas, and loss of tax revenue, particularly where dead land has forced new development to spill over into suburbs or unincorporated areas beyond the municipal boundaries. Recent legislation at the federal and state levels may present new opportunities for reclaiming dead land, replatting it, and putting it back into productive development. The study of this feature of urban settlement geography offers much opportunity for practical accomplishment in the near future.

Much study has been given to the problem of excessive urban expansion, particularly in relation to the problems of municipal planning and finance arising out of the lower densities and extensive urban "sprawl" which was facilitated by the motor vehicle and modern highways. The discordance between the multiplicity of small municipalities and special-function districts on the one hand, and the necessity for considering and planning the future development of entire metropolitan areas as functional geographic entities on the other, has given rise to a number of noteworthy metropolitan regional planning studies /31, 32/. In a few instances, the problems have been attacked, with more or less success by official and unofficial metropolitan planning agencies some of which have employed geographers on their staffs. An important field for future investigation, although not necessarily one in urban geography, is the legal and political mechanisms by which

metropolitan planning may be implemented. There is also opportunity in these problems for a merging of disciplines as illustrated by an article jointly authored by a geographer and a political scientist /33/.

Land Uses

The individual kinds of land use within urban areas have been studied, particularly in the past two decades /34-43/. Geographers have made contributions, along with land economists and others. Residential areas have been investigated in considerable detail /44-47/. The growth of large-scale public housing project in the 1930's, the rapid expansion of zoning, the real property inventories, the emergency war and postwar housing programs, and the recent activity in large-scale public housing and urban redevelopment under the National Housing Act of 1949 have all spurred research into the nature and development of residential areas. Especially important as a field in which geographers have made important contributions has been the delimitation of blighted areas by the use of statistical criteria resulting from field surveys /48-49/. These studies have, in far greater detail than those of Burgess, described the blighted areas which are characteristically located on the fringes of the central business districts and adjacent to industrial areas. The resulting definitions and delimitations have taken on great practical significance, for federal and much state legislation limits redevelopment and related housing activities to areas which are blighted.

During the 1940's urban redevelopment became an important potential influence in effecting changes in city patterns. By urban redevelopment is meant the assembly of land in blighted areas, both occupied and the vacant dead land, the clearing of titles, and the selling or leasing of the land, at

a written-down cost competitive with raw vacant land, by a public redevelopment agency to a private or public redeveloper, for development in accordance with an approved plan. Because of the adverse effects of adjacent blight, it is now realized, and so stated in the National Housing Act of 1949 which provides substantial loans and grants for land cost write-downs, that redevelopment must occur in areas sufficiently large to constitute neighborhoods with the inherent strength to support further redevelopment.

The basic physical unit of residential areas within cities is regarded by many urban geographers and planners as the neighborhood unit /50/, which is an area of about one-quarter square miles, varying with population density, bounded by arteries carrying through traffic around rather than through the neighborhoods, with local access streets designed to discourage through traffic, with an elementary school and appropriate surrounding open space so located as to be within walking distance from all parts of the neighborhood without crossing heavy-traffic streets, and with appropriate local shopping and other neighborhood facilities /51/.

Neighborhoods, in turn, are grouped into communities /52/, surrounded by natural or artificial breaks in continuity of residential development, and containing high schools, major outlying shopping centers, and other facilities serving groups of neighborhoods.

Although neighborhood units may be recognized in many older sections of cities, the principal value of the neighborhood unit as a geographic concept is in its application to areas for future residential development or redevelopment, both on vacant land or the urban periphery, and on land to be cleared in the blighted occupied areas.

The skeletal framework of most urban patterns is not the residential

areas but the industrial areas. There are several typical locational patterns for these industrial areas: strips along waterways and railway routes in the older sections of cities; strips and individual plants along circumferential belt lines which intersect the radiating trunk-line railroads near and beyond the urban periphery; clusters of industries in industrial satellite communities beyond the continuous built-up urban area; and, finally, scattered industries intermixed in areas predominately devoted to nonindustrial use, either at random or in small planned industrial districts.

Because the industries which use the most extensive areas of land are generally those which handle heavy materials, the railroad pattern of cities is closely related to the pattern of industrial land use /53, 54/. Typically, the spider-web pattern of radial trunklines and intersecting belt lines, together with the bands of industry for which these railroad lines are the axes, produces a series of cells, within which the residential communities develop. In cities located in hilly areas there is, of course, a close correlation between railroad routes and industrial locations and the terrain, particularly since valley sites often offer the best level land available for industrial establishments. Organized, planned industrial districts, generally with railroads playing an important role, are becoming increasingly important. A possible trend in the near future may be toward large-scale planned industrial district redevelopment in blighted areas now occupied by either obsolete industries or housing.

Decentralization of industry toward and beyond the urban periphery is an important trend in most cities, indicating the need for analysis and study of the centrifugal forces which cause outward movement /55, 56/. There is a fundamental conflict between the ever-lower density and consequent larger

areas of urban development on the one hand and the functional convenience of centrality on the other.

Size of Cities

Much thought has been given to the optimum size of cities /57, 58/. A series of mathematical generalizations has been developed to describe the relationships between city size and population /59/, a concept which planners have long studied in terms of population density for good living conditions. Some persons decry the increasing size of cities, and the "new towns" movement for planned urban decentralization has many advocates. On the other hand, some favor highly concentrated residential areas, with tall buildings but covering a small proportion of the land area, thereby giving light, air, and open space. The atomic bomb and other defense considerations may become significant in shaping future city patterns along these or other lines /60/.

The time-distance-cost relations of commuting between place of residence and place of work, and the effect upon these relations of traffic congestion because of high urban densities are of major importance. The highways, expressways, public transit systems, parking and terminal facilities are making the problem more acute, but at the same time, if developed with consideration of relations to each other and to the land-use pattern, offer potential opportunities for better future cities.

APPLICATIONS FOR URBAN STUDIES

Practically every element and technique of urban geography is useful for some practical purpose. Many of the smallest details of urban land use and morphology of certain foreign cities were useful and used by the military during the war; at the other end of the scale, some of the theories developed

by geographers or others have been useful to the theory of marketing. Undoubtedly much wider application is possible as geographers learn to work on business problems, and business men learn of the potential contribution of geographic methods. As in all fields of geography, some of the most significant contributions to applied urban geography have been made by students of other disciplines. Geographers will do well to move outside their own literature to familiarize themselves with these contributions.

Geographers are employed by business organizations in studying store locations and other intra-urban marketing activities. The leader in this field has been William Applebaum, who pioneered and perfected techniques for locating supermarkets scientifically, using geographical reasoning and techniques. Other geographers have prepared basic marketing maps and served as marketing consultants for newspapers. Finally, the work of geographers in delimiting trade areas has furnished basic, widely used marketing information for many cities. Marketing contributions and problems are treated in greater detail in the chapter on economic geography.

Because of the almost complete lack of intra-urban census data, geographers have been forced to rely on field techniques to delimit income areas and establish the size of business centers. Proudfoot pioneered a census bureau study of Philadelphia as a model for intra-city business statistics in 1937. Because of cost, apparently his excellent plan was never extended to other cities, although his work has provided a base line for comparing and estimating conditions in other cities since that time. Geographers now have two new sources of data: 1) retail trade data by groups of census tracts from the Census of Business for 1948 (not as satisfactory as Proudfoot's scheme, but far better than nothing); and 2) income

data by census tracts from the Census of Population of 1950. Such data should enable great strides to be taken in comparative intra-urban market analysis, useful alike to geography, business, and city planning.

During the war, geographers regularly published analyses and descriptions of cities and ports. In England, geographers pioneered techniques for urban target analysis, resulting in "zone" maps such as those developed by Dickinson. Unfortunately both these types of studies are restricted by government agencies and have not been made available. Today, geographers are engaged in the study of cities in relation to specific problems of civilian defense and industrial dispersion.

The range of other contributions is too long to enumerate. A few, selected at random, are: 1) directing census tract divisions in individual cities, although unfortunately geographers have been called in too late in most cases to correct fundamental earlier errors in thought behind most census tracts; 2) serving on location committees for TB chest X-rays; 3) consulting with industry on intra-urban location problems; 4) consulting with and working for mass transportation media in planning urban transit routes, and 5) directing the research programs of city planning agencies, as geographers have done in Chicago, Philadelphia, and Cincinnati.

Geography has a unique contribution to make to the field of urban planning./63/. Because geography's primary concern is the synthesis of the natural and cultural features of regions and the occupancy of the land, it, uniquely among the sciences, is concerned with areal synthesis, both in the past and in the present /64-66/. The projection of these phenomena and their regulation constitutes the field of city, regional, state, and national planning. The close relationship between urban geography on the one hand and

planning on the other is demonstrated by the large numbers of applications made of geographic knowledge and techniques in the planning process and in the use made by geographers of the studies made by planners and planning agencies /67/. Geography is recognized by many planners as being one of the more important disciplines contributing to the planning process, and an educational background in geography is increasingly recognized as one of the several prerequisites to responsible planning positions.

The special contribution of urban geography to planning includes: knowledge and application of cartographic techniques; classification, survey, and interpretation of land uses, both rural and urban; analysis of urban functions in regional economy, and the application of that knowledge toward policy formulation, and delimitation of regions and of geographic areas within cities for planning purposes.

Among the specific geographic contributions to planning in recent years have been: 1) application of the concept of the importance of the economic base in describing urban functions and in planning their future development; 2) development and use of techniques of classification and description of urban land uses for planning and zoning; 3) the delimitation of geographic areas, notably the "urbanized area" and census tracts for the tabulation of statistics of the Bureau of the Census which constitute one of the primary sources of data for use in planning; 4) the development of techniques of air photography and photographic interpretation /68/ and 5) methods for estimating future land requirements and their probable distribution /69/.

NEEDED RESEARCH IN URBAN GEOGRAPHY

The geographer is concerned with the character of existing urban centers, because they are distinctive features of the cultural landscape, and because cities are important out of all proportion to the relatively small areas that they occupy. It is the responsibility of the urban geographer to study and interpret the functions, sizes, forms, and growth of cities.

Within this realm of geographic investigation, two general types of approach can be followed. One is to increase our basic knowledge, in order to build a body of theory concerning urban settlements and their functions. The other is to utilize the accumulated knowledge of cities to influence policy, or, in other words, to aid in directing new developments and in altering old ones.

Comparative Studies of Cities
in Different Cultures

A promising field of research in urban geography lies in the comparisons of the functions, forms and growth of cities which have developed within the frameworks of different cultures, as, for example, Oriental versus European and American, Latin versus Anglo-Saxon. Some American geographers, along with their foreign colleagues, have made and are making valuable studies of individual foreign cities or groups of foreign cities. They furnish much valuable information that could be used in such comparative studies. Particularly important are the works of Dickinson /70/ and others on cities of Western Europe, of Whittlesey / 71, 72/ and Munger /73/ on cities of Africa, of Hall /74/, Trewartha /75/, Cressey /76/ and Ginsburg /77/ among other cities of the Far East, and of James /78-80/, Stanislawski /81/ and Dicken

/82/ on urban communities of Latin America. The hypothesis that cultural tradition as well as physical environment is reflected in the characteristics of urban development can be tested only by comparative study of cities which have developed in different cultural contexts.

City Patterns and Sequent Occupance

Although a few urban geographers have made studies of the evolution of city patterns in terms of the sequent occupance, this approach offers considerable promise of significance, as does genetic studies of the origin and spread of individual elements or characteristics of city patterns. An interesting example of the former type of study is James' paper on Vicksburg /83/, and of the latter, Stanislawski's on the origin and spread of the grid-pattern town /84/. Such studies of a genetic nature straddle the fields of urban and historical geography. In addition to their importance as studies adding to our basic knowledge, they have value in terms of projection into the future, and hence can be useful in city planning.

Suburban Settlements

As residents of central cities migrate to the rural-urban fringes to live, and as industry, encouraged by federal policies which encourage dispersion beyond existing concentrations as a defense measure, seeks new sites on the urban fringes where it may freely expand, geographers must turn their attention more and more to the characteristics and growth of suburban settlements. Although a few geographers have produced significant studies of urban fringe areas /85-89/, such studies are relatively few in comparison with the large number of detailed studies of central cities. With population, industry and retail trade increasing in suburbs and fringe areas much more

rapidly than in the central cities of the United States, studies of suburban expansion will become increasingly significant.

Urban Ribbons

Paralleling the growth of suburban and rural-urban fringe developments is the expansion of urbanization into the countryside, principally in the form of ribbons or strings along major highways, particularly in the past two or three decades. A new settlement form is emerging, which is urban in character, and completely highway-oriented. It is composed of such individual features as eating establishments, drive-in movies, and residences far from the central cities in miles but accessible readily by automobile. Such ribbon settlements extend far beyond the suburban and rural-urban fringe areas, and in some instances are continuous between major cities scores, and even hundreds of miles apart. Studies of the characteristics, patterns, and development of this new urban form should be made. Because of their large extent, the techniques of detailed land-use mapping which have been developed for urban areas are not feasible in application to these ribbons, yet more detail and hence larger scale mapping than is customary for most rural studies is called for. Prerequisite to studies of these urban ribbons is the development of new techniques of land-use mapping at intermediate scales. Recent experiments along this line show promise /90/.

Optimum City Size, and New Towns

City planners, architects, and others have been much concerned for many years with the question of the optimum size of cities, and the desirability and possible forms for new towns, which are planned to siphon off excess population from existing large urban concentrations. Geographers, in general,

have contributed little to knowledge of the fundamental assumptions and hypotheses behind the innumerable plans for decentralization of cities and for new towns related functionally to, but not located in proximity to, existing cities. The Garden Cities of Ebenezer Howard, the Broadacre City of Frank Lloyd Wright, the skyscraper cities of Le Corbusier, and other new town schemes, both theoretical and actual, have been conceived, and some of them born, with little reference to contributions by the geographer. Knowledge of optimum city size and relative desirability of new towns can better be obtained with consideration of the basic functions of cities and towns, their origin and growth, the amount and distribution of their land uses actual and potential, and after study of the comparative forms of cities. All of these are contributions which can be made by urban geographers, in measure far beyond that which is so far in evidence. Such applications of geographic knowledge can best be made, however, after much greater advances in basic geographic knowledge of cities, and the roles of various types and forms of communities than have been attained thus far.

Internal Relations of Cities

Fundamental research would be profitable on the internal relations and connections of cities, primarily to gain basic understanding of the urban unit. Mere accumulation of static measures of land use and other phenomena does not establish the interconnections between the phenomena. Knowledge of these interconnections would also provide some useful answers to the decentralization controversy, and would have wide practical application.

Very little has been done by geographers on internal movement of people and goods within cities /91/, possibly the best index of functional

interconnection among the various parts of the urban organism. Basic to the pattern of urban development is the internal and external transportation with which a city is provided. Study of transportation and traffic flows in urban areas constitutes a broad field which challenges the urban geographer as well as the transportation geographer. A more detailed discussion of this field is in the section on transportation in the chapter on economic geography.

Since World War II, origin and destination studies have been conducted by traffic engineers in a large number of American cities and metropolitan areas. Some of these studies are so detailed that one can obtain the origin of all persons in a large downtown building. Others are less complete. Each study tabulates origin and destination, type of vehicle used, time of trip, trip purpose and other items by zones and sub-zones within the city. Geographers could contribute much in the delimitation of zones which would adequately portray in the survey tabulations the interconnections among the various functional areas of the city. The uses of such a survey in geographic investigation are manifold. Such surveys constitute a basic source of information, both existing and potential, which geographers could well use much more intensively. The first problem would be to study the various origin and destination surveys that have been made to see what can be obtained from them, then to recommend additional questions and tabulation forms, finally to encourage expansion of their scope to cover information related to basic urban patterns not specifically connected with detailed planning of traffic arteries.

The flow of telephone messages would also establish the internal and external interconnections of a city. The Bureau of the Census, for example, already makes limited use of such messages in determining the outer edge of

the metropolitan area when other measures give an inconclusive answer. In such cases, when there are on the average less than four calls per month per phone from the outlying center to the metropolitan core, the outlying center is not considered to be a part of the metropolitan area. Undoubtedly other functional gradations could be determined within and without the city.

Considerable work has also been done by real estate and marketing specialists on pedestrian traffic as a basis for picking store locations, but very little has ever been done in the way of utilizing these data in preparation of pedestrian flow maps or in geographic analysis of flows.

Symbiotic Relationships

The study of symbiotic relationships within urban areas provides a fundamental field of inquiry which has been relatively neglected by geographers. This concerns itself with the study of functional and locational relationships among land uses and activities within a city. Certain urban activities and land uses are located as they are primarily because of relationships to other land uses and activities, as, for example, the clustering of garment manufacturing in "garment districts," the location of printing establishments on the fringe of a central business district which constitutes the city's major market for printing, or the location of a shopping center just outside the main gate of a large factory. Further, the structure of residential communities requires investigation in terms of relations between residential areas and place of work, schools and other focal establishments. There may be many symbiotic relationships whose existence is not even suspected. It is possible, and indeed probable, that many activities and land uses are located because of a symbiotic relationship which once existed but

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which disappeared with the termination of the related activity. If such relationships could be discovered, the geographer could more effectively forecast trends and changes in location, and in the urban pattern generally. Also related is the measurement of consequential changes in land use and other urban phenomena attendant upon introduction of a new industrial or other establishment in a specific area. Examples of such changing relationships in the past are abundant, and their study could possibly lead to establishment of principles useful in planning for orderly adjustment to such situations in the future.

Summary

The most promising directions for geographic research on urban areas in the foreseeable future can be listed as follows:

- 1.) development and application of new techniques of area mapping and analysis, including use of air photographs, land-use mapping of fringe and ribbon areas of urban expansion at intermediate scales, use of origin-destination traffic surveys and other new survey techniques, and closer collaboration with city planners, engineers and others whose interests in cities lie on the periphery of geography;
- 2.) empirical derivation, after numerous case studies of specific cities, of principles and generalizations relative to the forms, functions, arrangements, sizes and evolution of cities and towns;
- 3.) application of geographic concepts toward practical ends, as in city planning, marketing research, real estate development, and traffic planning.

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