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Man's Movement and His City

Cities are systems created by man's need and ability to move.

C. A. Doxiadis

Man's relationship, physical and metaphysical, to his city has been interpreted in many ways, successfully and unsuccessfully. Here I am concerned mainly with the relationship of man's movement to his city. It is necessary to understand this relationship at any time, but especially today, when our cities are in a major crisis.

If we fly over any city today, we will see it expanding along the highways or railway lines and canals, and we will probably say that the systems of transportation have a great influence on the cities. That is true. But we sometimes unjustifiably view our cities mainly in terms of systems of transportation. We see that the cities suffer from congestion, and we imagine that, by creating new highways, we will be able to take the very great pressures of traffic out of our cities. Some people even believe that, by solving the problems of transportation in this way, we can solve the problems of the cities.

Such reasoning is only partially correct and leads to invalid conclusions. If we view the problems of our cities only as problems of transportation, then we cannot help the cities, because transportation is only one of many factors and any fundamental solutions must involve them all. Let me give an analogy. The basic unit of the city can be described as a molecule with five elements or "atoms": nature, the original natural environment of man; man, who evolved in nature; society, formed by man and seen here as the system of relationships between men, which may work for or against the interests and values of man; shells, all types of structures and other buildings created by man; and the networks, or systems of transportation, of power, of water supply, of telecommunications, and so on. If we break this molecule, we no longer have a city. However, it is sometimes helpful to consider one element apart from the others in an effort to understand the problem in all its aspects.

The systems of transportation are only a part of one of the atoms or elements of the city molecule—the networks—and this has to be understood before we can proceed. The very term *transportation* may be misleading, since our real interest is man's movement. We tend to forget man's natural movement, based on his own forces, and this is why we have lost the human scale today in our cities. We do not allow people to walk, we "transport" them; we do not allow our children to grow normally; we leave ourselves no room in which to move. We should think of the networks of the city molecule as having four parts: the movement of man, of goods, of power, and of information. "Transportation" refers to the first of these.

Also, before we proceed, we must understand the two basic notions *man* and *his city*, and then try to connect them. We must understand man because he is our main client, and his satisfaction is our main goal; it is for him we are working. Then we must understand the city he builds, since most of his life is spent within it. Only then can we understand man's movement, which connects him with his city.

An understanding of man requires the ability to see him not only as our eyes see him—that is, as a body, or a body plus clothing—but as a system of concentric spheres [in Edward Hall's very apt concept (*1*)]. The system starts with a sphere representing what man sees, but this sphere expands to include what he smells or hears, and expands again to include the space that his mind encompasses, and again to include the space that his soul or psyche encompasses.

An understanding of the city of today requires the ability to see it as a complex system made up of the five units noted above and differing in two

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fundamental ways from the common concept of a city. First, this city is not static, as cities were in the past when they were confined within visible or invisible walls; it changes continuously. It is no longer a polis; it is a dynapolis —a dynamically expanding system. Second, the city, like man himself, is not only what we see; its real body goes much beyond its physical limits. The built-up part is only the physical nucleus of many forces which radiate from it. Some of these forces—the economic ones, for example—radiate along the transportation lines, and others, such as the esthetic ones, radiate in different ways.

In order to understand man's movement in his city we have now to think of his system of spheres as being in motion within the dynamic system of the city. This interrelationship creates a great series of combinations of elements, material and nonmaterial, which touch many aspects of the problem of urban life. At the root of it all is the problem of how far and in what way man can move physically. This is the aspect on which I concentrate in this article. To study this basic aspect of man's movement, we must think, this time, in terms of a system of circles—or sometimes, again, a system of spheres. We must think of man as being at the center of this system, and of the circles or spheres as representing what I call his kinetic fields, or the distance he can move within a certain period by walking, by using animals, or by using vehicles (Fig. 1).

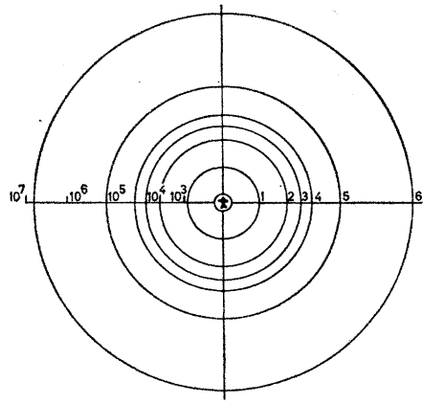


Fig. 1 (left). Man as the center of a system of kinetic fields, with radii (in terms of distance that can be covered in 10 minutes at walking or vehicular speeds) as follows: (1) walking (5 kilometers per hour), 830 meters; (2) horse-drawn vehicle (25 kilometers per hour), 4150 meters; (3) automobile (60 kilometers per hour), 10,000 meters; (4) train (120 kilometers per hour), 20,000 meters; (5) jet (600 kilometers per hour), 100 kilometers; (6) rocket (40,000 kilometers per hour), 6700 kilometers.

Before the Era of Cities

Before the era of the cities, which started several thousands of years ago, people passed through a long process which led from nomadic life to life in settlements of a few people and then to life in composite settlements of many people—that is, from isolated, nonoverlapping kinetic fields to overlapping ones.

At the very beginning of this process the kinetic fields of families or small groups of people probably looked, in geographical space, like isolated cells in the warm waters before the creation of multicellular groups. Then the kinetic fields came in touch with each other (Fig. 2a), and then they started to overlap (Fig. 2b). Such areas of overlap were at first probably areas of conflict, but gradually man understood that he had much to gain from coming closer to his fellows and from letting his kinetic fields coincide with theirs; so people came close together and allowed their kinetic fields to coincide to the greatest degree possible (Fig. 2c). Thus, instead of each man's having a separate kinetic field, there was a common field, for many people.

The result of this coincidence of kinetic fields was the creation of organized settlements. So long as people lived far apart they did not need to organize space, but when the population grew more dense, such organization became imperative. When people became aware that the distances between the compounds in which they built their homes—distances which they had to cover many times each day—were needlessly great, they tried to bring the compound walls closer together. Then, after remarking that the distances between the homes themselves were needlessly great, they gradually made their individual plots very regular in shape, so that the plots could be arranged in a more compact pattern and the distances from home to home reduced. This was man's first attempt to organize space in order to minimize the distances between people (Fig. 3). He made similar efforts to reduce the space between rooms, and between villages; the goal was always to minimize distances between people. In this way man discovered a basic law—how to organize space—and prepared the way for building cities.

During this process man has organized many types of human settlements, many of which survive today. We must consider all these types if we are to understand man and his city, viewing the kinetic fields of man in his settlements in all their variations and studying all the problems they create and the solutions they provide. This is the task of ekistics, the science of human settlements (*2*).

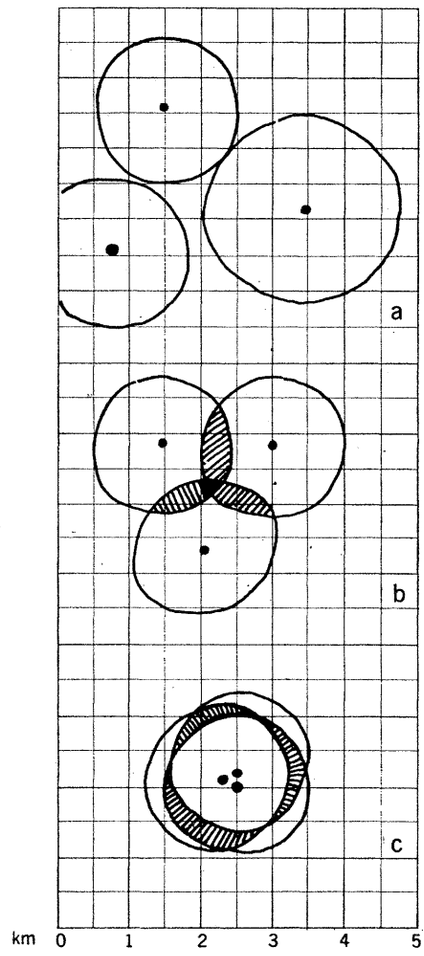


Fig. 2 (left). Toward a synthesis of kinetic fields. (a) Kinetic fields which do not overlap and do not lead to a synthesis; (b) kinetic fields which overlap and do lead to a synthesis; (c) kinetic fields which overlap to the maximum degree allowed by the static fields and lead to a complete synthesis.

The Cities

The city was the first form of complete organization of man's living-space to prove of universal value. Man, by trial and error, arrived at the same conclusion at nearly the same time in several parts of the world—the conclusion that he needed an urban settlement with certain characteristics in order to organize his urban life and facilitate his rural life. The main characteristic of such settlements arose from the fact that people do not want to have to walk for more than 10 minutes in order to reach the center of their settlement from the periphery. Thus, a man's individual walking field was a circle having a radius (in terms of walking time) of 10 minutes.

The process which led to the formation of the city by consolidation of men's kinetic ekistic fields—that is, men's kinetic fields in their settlements —started with consolidation of non-organized, individual walking fields (Fig. 4a) into unified, organized individual walking fields having a radius of 10 minutes (Fig. 4b). The common kinetic field occupied one-fourth of the total area covered by the individual walking fields (Fig. 4c) and led, finally, to the development of a single built-up center for all the people of the settlement (Fig. 4d).

Such systems of kinetic fields, based on a man's walking field, led to the growth of a very specific kind of city which was, for thousands of years, in all civilizations, almost the only type of urban settlement. We call this a city of A-level organization. Such cities had the following characteristics in common: they were compact urban settlements; the area they occupied was no larger than 2 by 2 kilometers; they had no more than 50,000 inhabitants. The kinetic fields set their maximum physical limits. Very few of the cities known to have existed during these thousands of years did not have these characteristics. Larger cities were occasionally formed when a tyrant compelled people to abandon their natural settlements and assemble in a major one, as occurred in Syracuse, in Sicily, under the tyrant Gelon, in the 5th century B.C. Such cities were very short-lived; they are rare exceptions to the rule.

Similarly, the total area of direct influence of the city (that is, the area of the city-state) was based on an individual walking field. A man walking continuously could not cover more than 50 kilometers between sunrise and sunset. A man living in the country wanted to walk to the city between sunrise and sunset and not have to spend the night in the open countryside; therefore the city-states did not grow beyond a circle having a radius of 50 kilometers. Very often the radii were much smaller, so that a man could go to the city and return home before sunset.

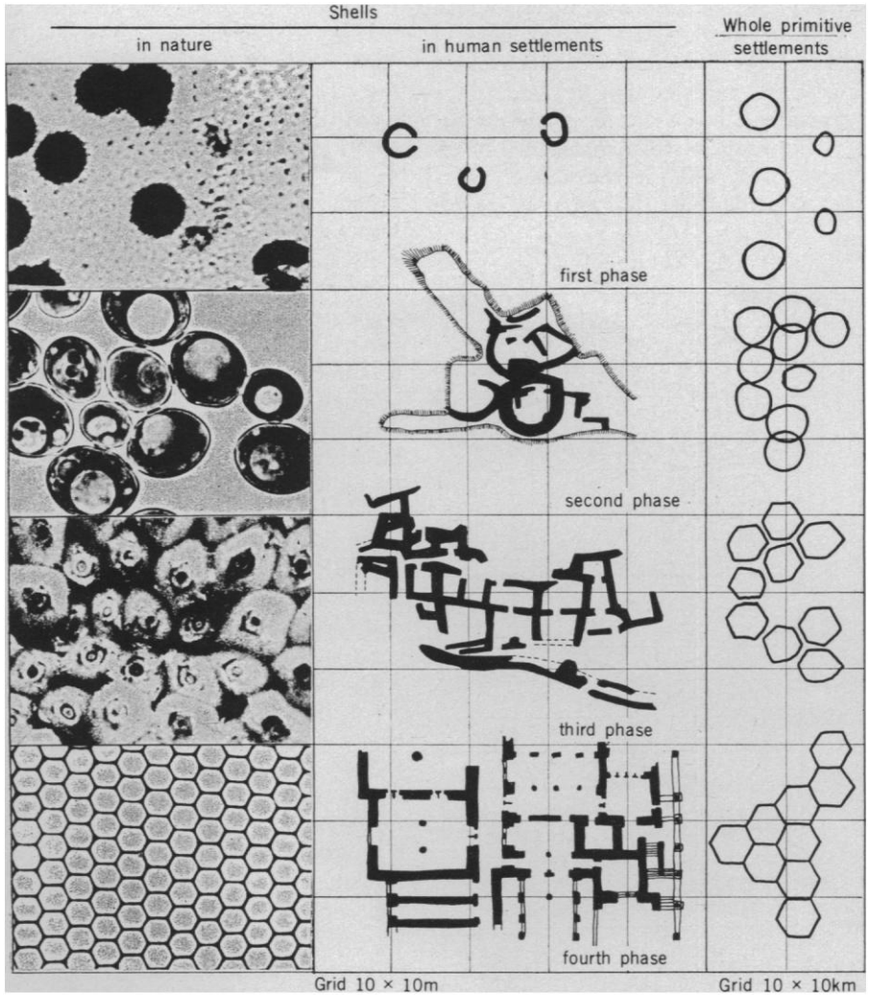


Fig. 3. Gradual organization of space in nature and in primitive human settlements. (Column 1, top to bottom) *Volvox* colony; cells of brewer's yeast (*Saccharomyces cerevisiae*); seeds of sunflower (*Helianthus annuus*); surface of the compound eye of the bumblebee, highly magnified. (Column 2, top to bottom) Plan of the entrance of an early Minoan ossuary, Kumasa; settlement at Orchomenus; plan of Helladic town, Malthi; the Palace of Knossos, restored plan of the entrance system and piano nobile of the west section. (Column 3) Boundaries between settlements. [From C. A. Doxiadis, *Ekistics, An Introduction to the Science of Human Settlements* (Oxford Univ. Press, New York, 1968)]

Capital Cities

There is only one category of cities which does not correspond to this general type; this is the category of capitals of empire—like Rome, Constantinople, and Peking. The reason for this exception is worth noting.

These capital cities had to grow beyond a population of 50,000 because of the great number of people needed to run the empire. At the peak of their development they had populations as high as a million people. As a result, these capitals grew beyond an area of 2 by 2 kilometers to as much as 6 by 6 kilometers, and this meant that the corresponding kinetic fields expanded from circles having a radius of 1 kilometer to circles having a radius of 3 kilometers, equivalent to more than 30 minutes of walking time. This, as developments proved, was too much walking, and therefore people used horse-drawn carts; for these they paved their roads and made them straight, as the layout of Peking, last and largest

of the ancient capitals, proves (Fig. 5). New dimensions led to new solutions. The city with A-level organization became a city with "B-level organization," in which an attempt was made to superimpose on the kinetic field which connected people who traveled at walking speeds a second kinetic field connecting them when they traveled at higher speeds (Fig. 6).

In spite of such efforts, the lack of advanced technology made it difficult for the capital cities or the empires to hold together. These great cities of the past are remembered more for their monuments than for their transportation, more for their conquests than for their organization. They were easily disorganized, tended to deteriorate into slums, were often controlled by mobs; they usually shrank to normal population size after the empire was dissolved. Rome and Constantinople are examples.

In these centuries, man, despite his rare and short attempts at achieving B-level organization of his kinetic ekistic field, always had to return to the A-level organization based on his capacity to walk. The available technology was inadequate for maintaining B-level organization.

Dynamic Cities

The long period during which only a few, unsuccessful attempts to achieve B-level organization of kinetic fields in cities were made started coming to an end in the middle of the 17th century with the beginning of the scientific revolution, the forerunner of the technological and industrial revolutions. The static cities of the past changed into dynamically growing cities.

The first cities to change in this way were the capitals of nation-states; later, cities of special industrial or commercial importance were the ones that showed dynamic growth. With the advent of the railways the industrial or commercial cities grew even more rapidly, because much greater forces could flow into them. When they became the centers of highway networks (Fig. 7), they grew still more. Their main characteristics were (i) continuous growth (as yet there is no sign of change); (ii) an apparently unlimited need to grow; (iii) irregular shape; (iv) a size which could not be served by A-level organization of kinetic fields. The city turned into a dynapolis and then very quickly became a metropolis. It was too big to be organized

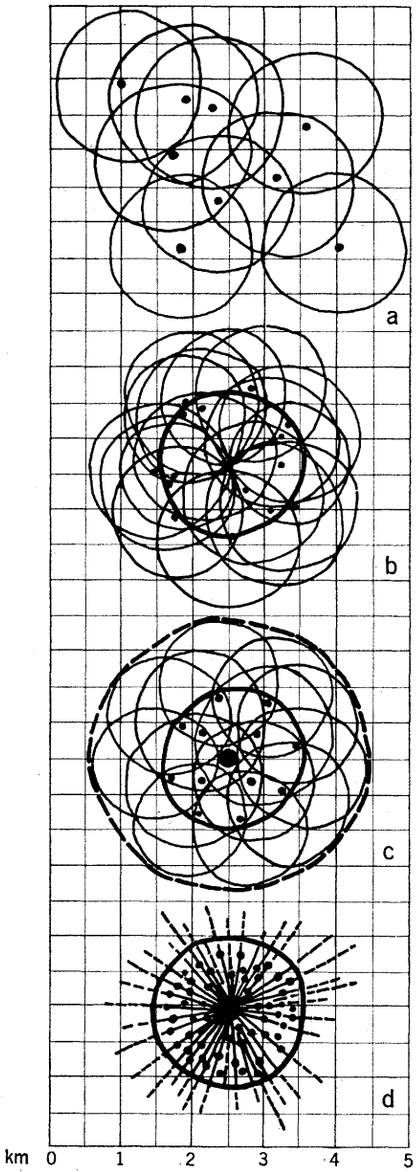


Fig. 4 (left). Creation of the city. (a) Urban, nonorganized individual walking fields; (b) urban, organized individual walking fields; unification of the field led to the development of an urban center; (c) the city's common field, equal to one-fourth the total area covered by all the individual walking fields; (d) the developed urban center. Fig. 5 (above). Peking, in A.D. 1409—an ancient capital having B-level organization of kinetic fields, showing synthesis of the initial plan on a grand scale. [From F. Jaspert, *Vom Städtebau der Welt*, reproduced in C. A. Doxiadis, *Ekistics, An Introduction to the Science of Human Settlements* (Oxford Univ. Press, New York, 1968)]

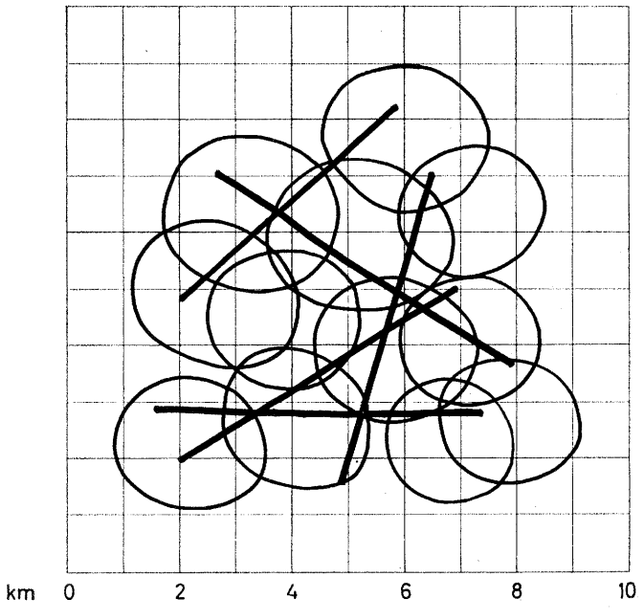


Fig. 6 (left). Two levels of kinetic-field organization: (circles) A level; (straight lines) B level.

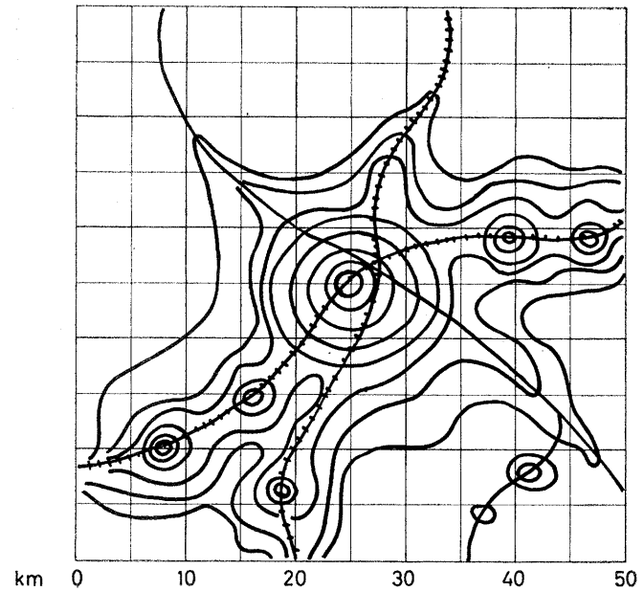


Fig. 7 (right). Transformation of the city into a dynapolis.

on the basis of an individual's walking field, and many systems of such kinetic fields became interwoven (Fig. 8a). It was at this time—the mid-19th century—that the metropolis was organized like a loose system of villages (Fig. 8b); London was known as such a system.

During the 19th century an attempt was made in western Europe to introduce B-level organization into the cities, similar to the B-level organization of the ancient capitals of empire, through the construction of wide avenues for horse-drawn vehicles. The size of the 19th-century cities was such, however, that, to speed transportation, the new avenues were laid out as diagonals across the existing gridiron system of roads. This was the period when Baron Haussmann transformed Paris (1853–70) by superimposing wide avenues, representing B-level organization, on the earlier patterns (see cover). This was the idea which inspired L'Enfant in planning the city of Washington.

Such transformation of the metropolis required great financial expenditures and provided only temporary solutions. This was because movement along the new arteries could not reduce by more than one-third the time previously required for traveling between distant points. Thus, as the cities grew larger, the longer distances meant that the time needed to get from point to point correspondingly increased.

Such unsatisfactory conditions in growing cities, coupled with advances in the technology of transportation, led to a third level of organization of kinetic fields, the C level, which started with the construction of subways in such cities as London, Paris, and New York. New lines now connected people over much greater distances (Fig. 9a), and these kinetic fields led to the consolidation of the metropolis and the creation of one strong center of high kinetic-field organization (Fig. 9b). Within such a metropolis we had the A-level organization of kinetic fields fully developed, the B-level organization partially developed, and the C-level organization fully developed.

The C-level organization of the city was relatively satisfactory, but only for a short time. The reasons were many: the metropolis was dynamic and continued to grow beyond the limits of the C-level kinetic field; the technological solutions were not satisfactory, especially those involving elevated trains or exposed lines of transportation; and then the automobile entered the picture. With the entry of the automobile the situation became confused because the effects of the automobile on the levels of organization were mixed; the automobile hurt the A-level organization and provided solutions for problems at the B level, but not at the C level.

As a result, the conception arose of building new highways cutting through the cities, in an effort to provide higher speeds and a fourth level of organization, the D level. But these goals were not attained, since the maximum operating speed of automobiles on the highways did not exceed 60 kilometers per hour and the origin-to-destination speed was much lower. In addition, the highways added many problems: lack of space in streets of A-level and B-level systems for automobiles fed into these streets by the highways; lack of parking space; and so on.

The Present Situation

Today we are in a difficult situation. We have not achieved proper D-level organization and, at the same time, many city-systems are growing into even larger systems, which require a fifth level of organization, an E level. Such systems often tend to merge into each other and to lead to transformation of the metropolis into the megalopolis. This situation required much greater attention than we have given it, and greater planning skill than we have yet developed.

Our city-systems suffer in many ways. Because the D level of organization was not completed and because the systems have continued to grow, the central areas suffer from many pressures and from disorganization. This is apparent in the type of economic activity of cities such as Detroit, or in the complexity of the trans-

portation network, or in the ugliness of many central urban areas (*3*). At the same time, because highways, especially in outlying areas, make it possible to drive at increasingly high speeds, people tend to live farther out and farther apart. In the last 40 years the average densities have dropped by two-thirds in several major cities of the world; this means that every person now uses three times the space he used earlier.

If we measure the distances between people within the various units of living space we find that the averages increase very rapidly from unit to unit—from 3 meters in a room, to 6 meters in a home, to 7 or 8 meters in an old city, to more than 20 meters in a metropolitan area, and so on. The theoretical distance between any two persons on the earth's surface, if the whole population is spread evenly over the habitable parts of the earth, is 400 meters. These distances between people make the maintenance of normal contacts difficult for everybody, but especially for the poor, for children, for the old and sick—precisely for those who probably need the contacts most.

In addition, the intrusion of the automobile into the paths of the A-level and B-level kinetic fields has made contacts between neighbors more difficult. Children can no longer run free or discover their world, and no one can enjoy his movement in the city.

The situation is worst in the central cities. We drive through them at an average speed of 8 to 16 kilometers per hour, a speed equal to or sometimes even less than that we had achieved at the beginning of the century with horse-drawn vehicles. Humanity has failed completely on this score. We have failed to recognize that there is a small-scale region in the city which has to correspond to the human scale; we have been too impressed by the machine, by the mass media of communication, and we imagine that the earth is shrinking. The earth is not shrinking, man is expanding. But this is an expansion of his senses, of his speed. In the small units of his living space and in his personal human relationships, man's scale remains what it has always been.

It is time we understood the need to change our attitude, to start thinking in a constructive way. There is no reason why man should lose the battle in the small-scale part of his life. We must begin thinking of the need to create sectors, in the heart of high-speed areas, where people can be served properly at the B level of organization, and in whose center they can walk freely, without crossing automobile routes. Automobiles can enter the sector for the purpose of serving people in their homes, without crossing the pedestrian routes. We must become convinced that our first two levels of organization (A and B) should be levels where man and the automobile meet without crossing each other's paths. Such considerations lead to the concept of a "human-scale" unit—the unit for a sector where the pedestrian and the automobile coexist without any conflict (Fig. 10).

Then we must see how we can best organize the C-level and D-level kinetic fields. This is not difficult if we decide to organize cities according to a clear-cut plan in which maximum use is made of the potential offered by existing automobiles.

The great difficulty arises at the fifth level of organization, level E—the one corresponding to the growing metropolis or the new or coming megalopolis. It is not too early to worry about this; we already have hundreds of metropolises and about 14 megalopolises, without having arrived at any satisfactory solution of the transportation problem. Their transportation systems provide connections from the periphery to the urban centers by road and rail, but many more, and much speedier, connections are needed. At present man spends much more time on the road than he did in the past, and this is certainly not to his benefit.

The situation for city-systems that grow beyond the size of the metropolis corresponds, on a different scale, to the situation which existed within the great metropolises of the Western world about 150 years ago. No megalopolis, such as that of the eastern United States, has yet been organized in a way suited to its size and population. The organization of a megalopolis today consists of many overlapping B-level, C-level, and sometimes D-level

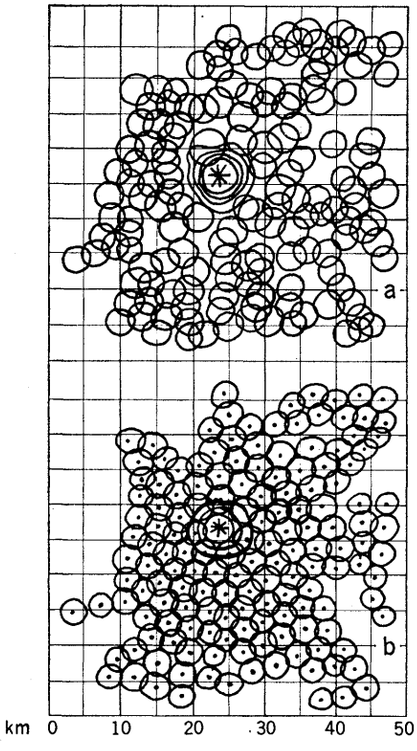


Fig. 8. Creation of a metropolis. (a) Urban, nonorganized individual walking fields; in size, the assemblage is typical of a metropolis, but not in organization; (b) urban, organized individual walking fields; in size and organization the assemblage is typical of a metropolis, but there is no unified field, thus this is not a true metropolis.

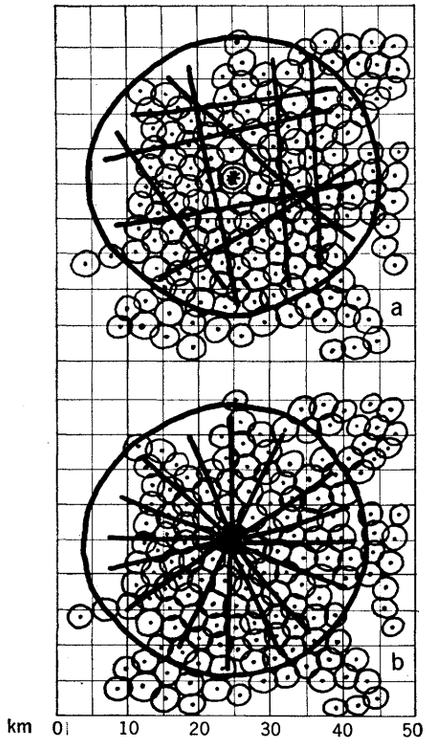


Fig. 9. Creation of a metropolis. (a) Urban, organized individual walking fields; in size and A-level and B-level organization the assemblage is typical of a metropolis; unification through the construction of subways leads to C-level organization and creation of a true metropolis; (b) the developed center of the metropolis.

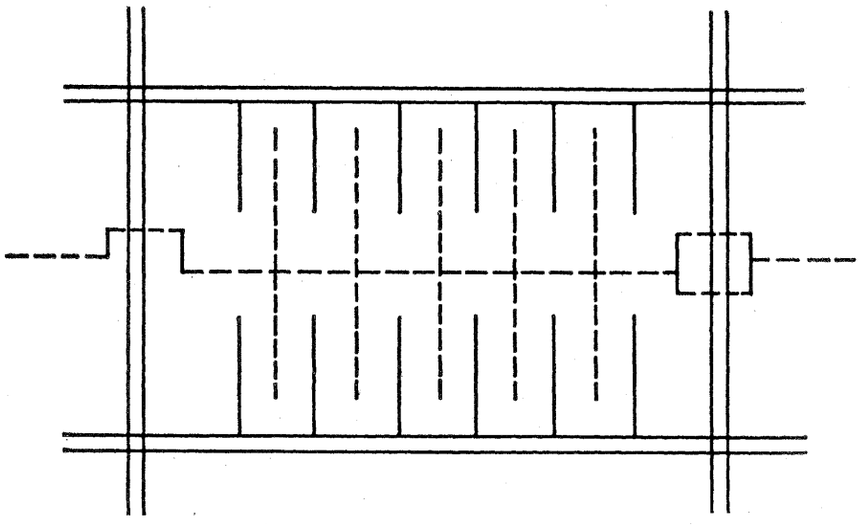
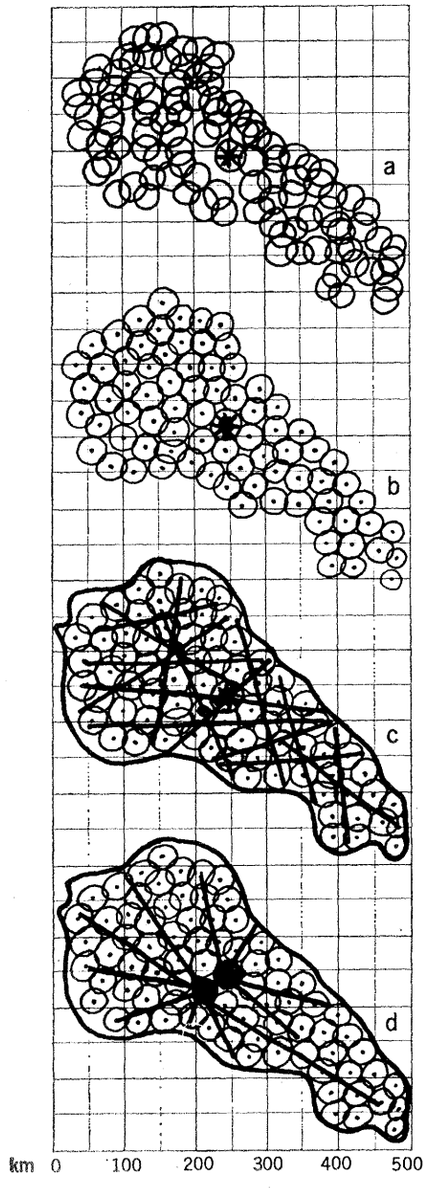


Fig. 10. The "human-scale" unit—the unit for a sector where the pedestrian and the automobile coexist without conflict. (Double solid lines) Roads for automobiles traveling between 100 and 160 kilometers per hour; (single solid lines) roads for automobiles traveling between 15 and 30 kilometers per hour; (dashed lines) roads for pedestrians.



kinetic fields based on the use of automobiles, buses, and railways (Fig. 11a). In some parts, A-level organization is being introduced (Fig. 11b), but higher-level organization (Fig. 11c) and consolidation of the various levels (Fig. 11d) are needed.

Only two attempts have been made toward realization of a fifth level of organization (level E). The first involves urban transportation by airplane, but this presents many difficulties: dependence of airplanes on outlying airports; overcongestion of airports; difficulties due to weather; problems of shifting from air to ground transportation. Thus, no satisfactory solution has been developed. The second is the attempt to provide trains much faster than conventional ones. Examples are the train now running between Tokyo and Osaka at 200 kilometers per hour, or the one, now in an experimental stage, which is to serve the eastern megalopolis of the United States.

The tasks ahead are great. In our time we have not achieved, for man's movement in the very big cities, what some big metropolises achieved 150 years ago. In this field we are behind the times, and we are paying for it. We must completely organize the D-level and E-level kinetic fields and the megalopolis.

Fig. 11. Creation of a megalopolis. (a) Urban, nonorganized B-, C-, and D-level kinetic fields; in size, the assemblage is typical of a megalopolis, but there is no organization or unification; (b) urban, organized B-, C-, and D-level kinetic fields; in size and organization the assemblage is typical of a megalopolis, but there is no unified field, thus this is not a true megalopolis; (c) unification of higher-order kinetic fields, leading to complete organization and to development of a true megalopolis; (d) the developed center of the megalopolis.

The Future

Although we have not yet adequately faced the present, we must look into the future, in part because any action that one takes in city planning is meant for the future, and also because the crisis and our failure will have much greater dimensions in the future, the reason being that disorganization, to the best of our knowledge, proceeds at a much higher speed than organization, within the human settlement.

We have reached a stage at which human settlements are millions of times as complex as settlements of the past, just as higher-order organisms are millions of times as complex as DNA. We can no longer face the problems of our settlements in ways that served in the past; we must demonstrate not only knowledge but creativity, especially in the area of kinetic-field organization—where we now lack it.

How can we meet this situation? The answer is not easy, but neither is it so difficult as to frighten and discourage us. We can perhaps compare the phase that we are now in with that reached by nature when it created the mammals. Nature met this problem by achieving a higher order of organization, through trial and error. This is the phase we are passing through. Man learned how to organize his cities for the era of the pedestrian, the horse-drawn vehicle, the train, and the early automobile, but he has been unable to organize them for the present era of the airplane and the missile, to say nothing of the era of the interplanetary and interstellar spaceship, which perhaps lies ahead. When we look toward the future we must remember that we will soon have cities needing five and six levels of kinetic-field organization. Eventually we will have a world needing eight levels of organization. In terms of ekistic kinetic fields this is our task: to organize our communities, which operate imperfectly with three and four organizational levels, for proper operation with five, six, seven, and eight levels (Fig. 12).

Goals

We must set ourselves clear goals and work toward their realization. We must first be realistic about the frame within which man must move: it cannot be anything less than the world, as man's ultimate city has the surface of the earth as its realistic limit. To overlook this basic fact is unrealistic, as man already moves about the earth in less time than it took him to cross the ancient city-state. Though at this stage we need not concern ourselves with extraterrestrial flights for the average man, we must be aware that the frame of his city is extrahuman, and our goal is to create, in spite of the inevitable extrahuman frame, a city with human content.

To do this we need a method, and its development becomes a goal in itself. The earth is too small for the coexistence of many uncoordinated systems of human settlements and uncoordinated systems of transportation such as we now have. We need, instead, a single system with several levels of organization based on modes of transportation of increasing complexity.

We can learn how to achieve this by following the process which led to the establishment of successful settlements, like the cities of the past, and of failures, like today's cities; we can learn from both.

We must start by defining the city we envision in terms of its kinetic fields and its transportation needs. We must then write specifications for the transportation systems and guide the technology that will develop them. We start with the same transportation times that determined the size of the ancient city-state—that is, an average of 10 minutes of walking time for the radius of the built-up area and of 8 hours for the radius of the city-state as a whole. With today's technology we can still have a city within whose built-up area man can move from point to point, by foot or vehicle, in 10 minutes and from which he can reach the most distant point in the city's area of influence in 8 hours, but now this area of influence will have become the whole world.

What would be the distance from the heart to the outskirts of such a city—that is, the radius of the central area? At what speed would an inhabitant have to move in order to reach the outskirts from the heart of the central area in 10 minutes? Here we can learn from nature's most developed organisms and try an assumption based on their physiology. In mammals, the ratio of the speed at which blood moves in the capillaries and the speed at which it moves in the aorta is about 1:400.

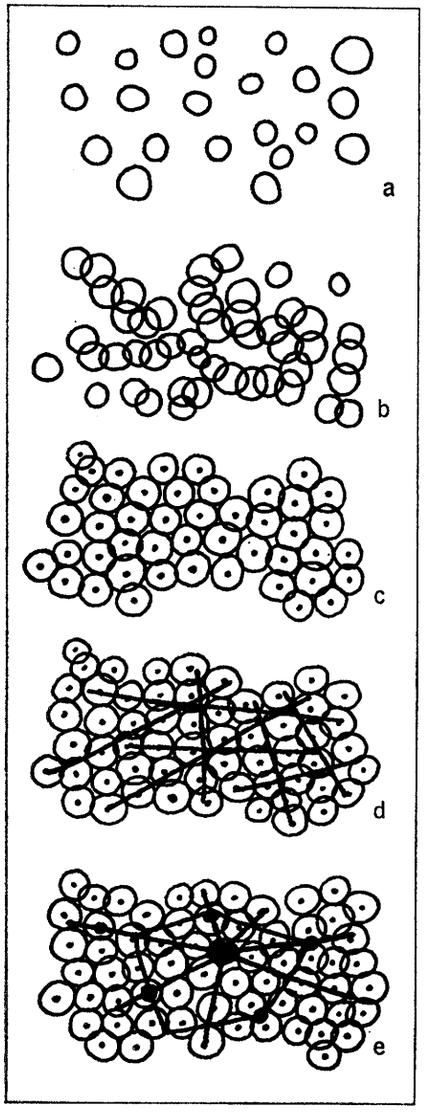
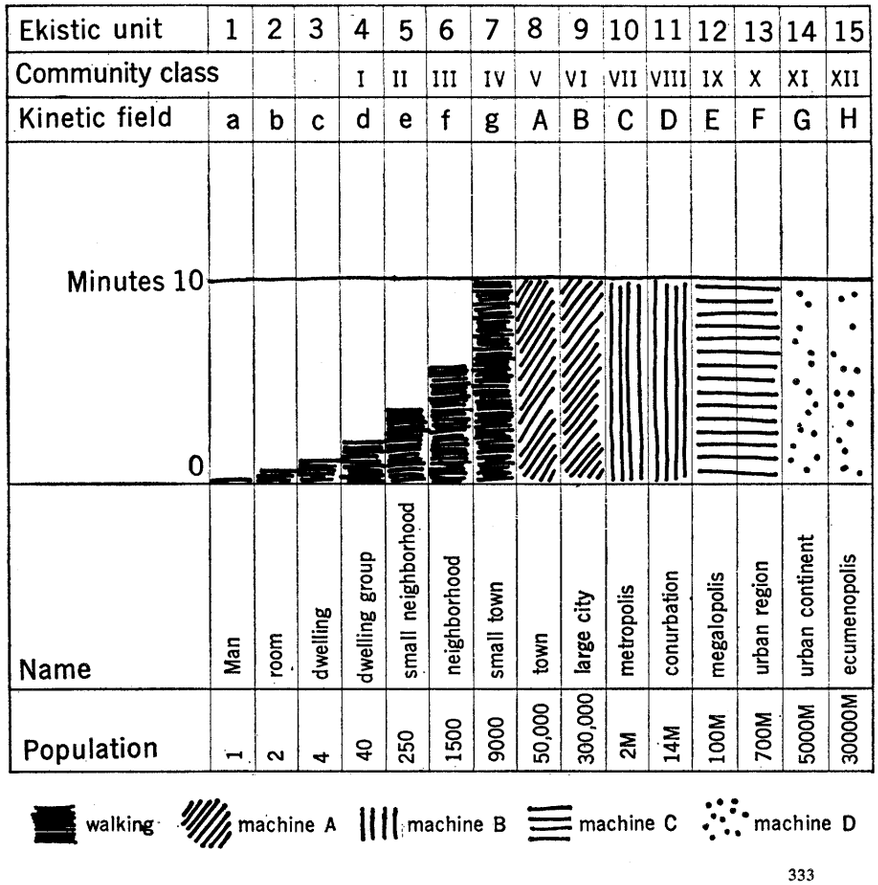


Fig. 12 (left). The organization of human settlements.

Fig. 13 (below). The ultimate terrestrial city from the point of view of kinetic fields.



If we borrow this ratio we find that, if man moves by foot in the "capillaries" of the city at 5 kilometers per hour, the maximum vehicular speed within the central or urban area of his modern "city-state" should be 2000 kilometers per hour. At such a speed man can cover in 10 minutes about 330 kilometers, or, when allowance is made for lower starting and stopping speeds, about 150 kilometers.

Such considerations lead to the conclusion that urban areas should have a radius of 150 kilometers. This, interestingly enough, is very close to the average radius for major urban areas of many of today's cities. This correspondence, however, should not be taken for anything more than it is: a coincidence which could perhaps be exploited. On the basis of the foregoing assumption we would be satisfied with speeds of 2000 kilometers per hour within urban areas, as, by such speeds, we could cover any distance in less than 10 minutes, and of about 3000 kilometers per hour between them, which means that we could make connections even between cities separated by a distance of 3000 kilometers in 10 minutes.

One can also make a different assumption. Why choose an analogy with the ancient city-state, with its 8-hour radius, at a time when rockets can already cover the distance between any two points on the earth's surface in less than 40 minutes? Could we not say that the whole earth will one day constitute a universal city or "ecumenopolis," which will operate like the individual cities of the type that followed the ancient city-state and served man successfully until the 18th century? (*4*).

On the basis of such an assumption we can envision a worldwide city as our ultimate goal from the standpoint of ekistic kinetic fields, a city where any distance between any two points may be covered within 10 minutes (Fig. 13). In this ultimate terrestrial city all points will be equally accessible in terms of time. Various means of transportation will be used, but the different vehicles will all cover a given distance in the same time, with equal comfort and safety for the passengers; the only practical difference for them will be one of cost.

If we believe that, by increasing the opportunities for person-to-person contacts, we multiply the chances for man's fullest development, this is the city we must build. Two questions arise: (i) Is such a city a possibility? (ii) Would such a city really be better for man? We cannot yet answer the first question. In trying to answer the second we must consider the two kinds of city I have envisioned and try to decide which one can best help man preserve his human values, make use of his talents, be safe and happy as Aristotle wanted him to be. This is a complex problem, beyond the scope of this article.

Practical Steps

Let me conclude with some practical considerations. If we want our cities to be more satisfactory from the point of view of man's movement, we must strive for a proper framework in terms of city size and time required to get from place to place; for preservation of all that is of value in our present settlements; and, even more, for the reestablishment of human values. We can proceed toward these goals in two important phases.

The first phase can start immediately. We must build all networks for movement of goods (gas, liquids, and solids) underground, to free the surface of the earth of this unnecessary burden. Thus we will learn more about the technology of high-speed transportation through tubes. In this phase we must separate the kinetic fields based on man's natural motions from those based on machine transportation and thus set man free again to develop and enjoy his own microspace.

In the second phase, when we have learned more and when we can afford it financially, we should bring man's systems of mechanical transportation underground, to free much more of the surface of the earth for man's use and enjoyment. He will not find underground travel a hardship for it will take him no more than 10 minutes to reach his destination, as compared with the hours he now spends in cars, trains, or airplanes. Man will move to underground transportation systems when he is able to build them to his full satisfaction, in terms of travel time, cost, and comfort. This will not happen everywhere simultaneously, and the speeds attained will be lower than the theoretically most desirable speeds. It will happen first in areas of high population density and of high income, and initially the transportation speeds will be measurable in hundreds of kilometers per hour. Gradually these systems will spread, and the speeds will be increased until they approach the ultimate goals.

We are now entering the first of these two phases and thinking about the second. We need to develop our transportation systems in the proper direction, and in a systematic way. We do not yet envisage how this is to be done; we move in the dark.

References and Notes

1. E. T. Hall, *The Silent Language* (Doubleday, Garden City, N.Y., 1959); *The Hidden Dimension* (Doubleday, Garden City, N.Y., 1966).
2. The term *ekistics* is derived from the Greek words οἶκος (home) and οἰκῶ (settle down) and, as the science of human settlements, is concerned with the study of—and development of research, planning, and action on—the interrelationship of man with the environment created by him. For further information see C. A. Doxiadis, *Ekistics, An Introduction to the Science of Human Settlements* (Oxford Univ. Press, New York, 1968) and "Ekistic synthesis," *Ekistics* [a monthly journal published by the Athens Center of Ekistics], in press.
3. For further information on the megalopolis, see *Emergence and Growth of an Urban Region* (Detroit Edison Company, Detroit, 1966 and 1967), vols. 1 and 2; this work concerns a project of the Detroit Edison Company, Wayne State University, and Doxiadis Associates. See also C. A. Doxiadis, "The emerging Great Lakes megalopolis," *Proc. IEEE* (*Inst. Elec. Electron. Eng.*) **56**, No. 4 (1968).
4. For further information, see C. A. Doxiadis, "The coming era of ecumenopolis," *Saturday Rev.* **1967**, 11 (18 Mar. 1967); "Ekistic synthesis," *Ekistics*, in press.