THE CITY AS A BIOLOGICAL COMMUNITY

The Urban Ecosystem



Introduction

From man's beginning he has known intuitively that he is a social animal. The concept of evolution has always been strongly controversial because no other biological organism is quite like man, although the behavioral similarities between man and other animals have always been apparent. Our language is replete with comparisons of man with animal. For example, we use expressions like sly as a fox, bullheaded, gone to the dogs, piggish, ravenous, playing possum, snake in the grass, shedding crocodile tears, and many more in which the attributes of an animal are assigned to man.

The principal difference between man and all other biological organisms is that man has developed skills of language and of technology which have set him apart. The growing recognition of the relationship between the behavior of man the social organism and all other social organisms has come about not through the study of man's social behavior but through the study of the social behavior of other biological organisms. In biomedical research, discoveries related to physiological and biological disorders in lower animals have for decades provided clues leading to a better understanding of similar conditions in man. For example, hundreds of thousands of mice have been sacrificed for cancer research, and thousands of dogs have given their lives to advance our knowledge of cardiovascular malfunctions. Animals, such as gorillas, chimpanzees, and wolves, in their natural setting exhibit behavioral tendencies analogous to the behavior of man, and the ethology of man as an emergent science may well be one of the most significant sciences.

Biological systems develop and evolve to their most stable configuration for a given set of environmental conditions. Man's information and technology changes, his concept of himself and his environment changes, and he may even change his immediate environment to suit himself, but man's biology does not change, at least not very rapidly. He still needs 2000-3000 calories daily food intake balanced with appropriate minerals and vitamins, and although he may live on less or more, his diet remains within narrow confines or he does not survive. (The function of vitamin C may have been discovered in the 20th century but man's need for it is as old as the species.)

The consequence of biological development for man has been to limit his biochemistry to a predictable course, to limit his physical development to within a close range, and to define his repertory of behavioral responses to within a finite limit. Imprinting, sexual identification, and socialization operate in man with all the vigor and resoluteness found in "less intelligent" species, with the added complication of spoken-written language and its subsequent toolmaking explosion. One need not invent mathematics or the computer to throw a rock at a telephone pole, even though this is a complicated ballistics problem, but mathematics is essential to fire-control radar gunnery.

Radar-controlled gunnery is no more wonderful than throwing a rock, but its principles relate to speech-language-toolmaking rather than to the innate biology of the rock thrower. And more importantly, the rock thrower has not changed a whit simply because he can use radar-controlled gunnery.

Having defined toolmaking as progress, man has led himself to believe that since his tools have changed dramatically over the last few decades he must have changed also. In mid-20th century, man is more concerned with the environment for his tools than for himself. Where to park the car? How high should a skyscraper be? Where to land the jumbo jets? In some advanced technologies, man has adapted his entire life style to one transportation tool, as with the automobile in Los Angeles; or to one monotonously replicated housing tool, as with four-bedroom houses in suburbia.

Along with his deeper understanding of the physical universe and his increased ability to control or mediate its activity, man also increased his potential for colossal blundering. In essence, he has transferred his biological behavior mode, with its limited potential for mischief when used individually, to his ability for mass communication and mass destruction. The horror of modern warfare is not couched in man's capacity to destroy as an individual, but relates to his ability to command the enormous forces available to him through technology.

But technology has not changed the properties of man the biological organism. Average life expectancy has increased in recent decades, but absolute longevity has remained about the same in historical memory. Body size has changed with better nutrition, but the changes seem to be quantitative rather than qualitative. The essentials of good diet were not discovered in an ancient Sumarian home economics book; they were found in the abundance of edible commodities, animal and plant, in man's environment. Our present-day science of nutrition is based upon information after the fact of survival as biological organisms, not before the fact of science, technology, and planning.

No amount of toolmaking will transform man into anything other than a social organism. A smart one to be sure, perhaps the smartest, but, nevertheless, a biological organism who does things because "he wants to" or because it makes him feel good—"it" and "good" remaining undefined. Man exercises intuition as well as reason, and had a holistic view of his environment before the notion of language arose evolutionally. For better or worse, this is the man, with his linear, reasoned, logical information and his technological artifacts, but with his holistic sensory and memory apparatus, who is settled over most of the globe today.

Cybernetics as a logical tool was invented in an attempt to place machines in some analytical framework. No machine yet invented by man has evolved beyond simple idiocy and so it is somewhat surprising that cybernetics, in its most general and useful application, requires a greater understanding of mathematics than the average individual can bring to the problem. The supreme paradox of speech-language as a tool is that man can feel and subsequently act upon the knowledge of cybernetics as it applies to himself and his environment, although he may have great difficulty in comprehending the symbolic representations of the same information in mathematics. Similarly, man may feel good or bad, elated or sad without knowing a particle of biochemistry.

As a biological organism, man reacts to his environment. His environment includes other men,



plants, and other animals in the totality of physical, chemical, and biological factors. Before he could describe it cybernetically as a system, man's reaction to this environment was simple and direct and remains so; he adjusts to his environment or he does not survive. He may have been killed, poisoned, eaten alive, or burned, but time was on the side of the species and a behavior pattern evolved which was a process of sorting out successful patterns for survival.

The clue to understanding how man lives in communities lies in the fact that man evolved living in communities millennia before his capacity to understand the cybernetics of self-regenerating, self-regulating biological systems. Man evolved in communities and undoubtedly they have exercised a selecting influence upon him. Organisms living together in communities are the norm not the exception, and may occur in the plant and animal kingdoms at all levels of biological development, from the very simple to the most complex.

Biological communities vary considerably depending upon the particular environment in which they are formed and the types and kinds of plants and/or animals that populate them. The simplest distinguishing features of communities are whether they are sedentary or mobile, whether composed of one or more species, the stability of the species mixture, and the longevity of the group that forms the community. Many communities are short-lived and are soon overwhelmed by longer living, more versatile species or groups. For example, pioneer plant communities of an abandoned field are unstable and change rapidly and other communities are destroyed by predators (e.g., coral reefs when attacked by crown-of-thorns starfish). Many communities are disturbed by physical forces that erupt regularly or periodically such as fires or wars that have destroyed cities (e.g., Cologne, London, Chicago) and by natural disasters such as hurricanes that have leveled New England coniferous forests. Many communities change because the physical conditions in which they exist change, and even slight changes can have a profound effect over a long period of time. Mobile communities are less affected by minute changes in the physical or chemical elements of their environment. The wandering caribou herds of the Far North, the wandering bison herds of the Great Plains of North America, schools of herring, cod, anchovies, whales, and the animals, including man, that prey upon them are insulated from these minor

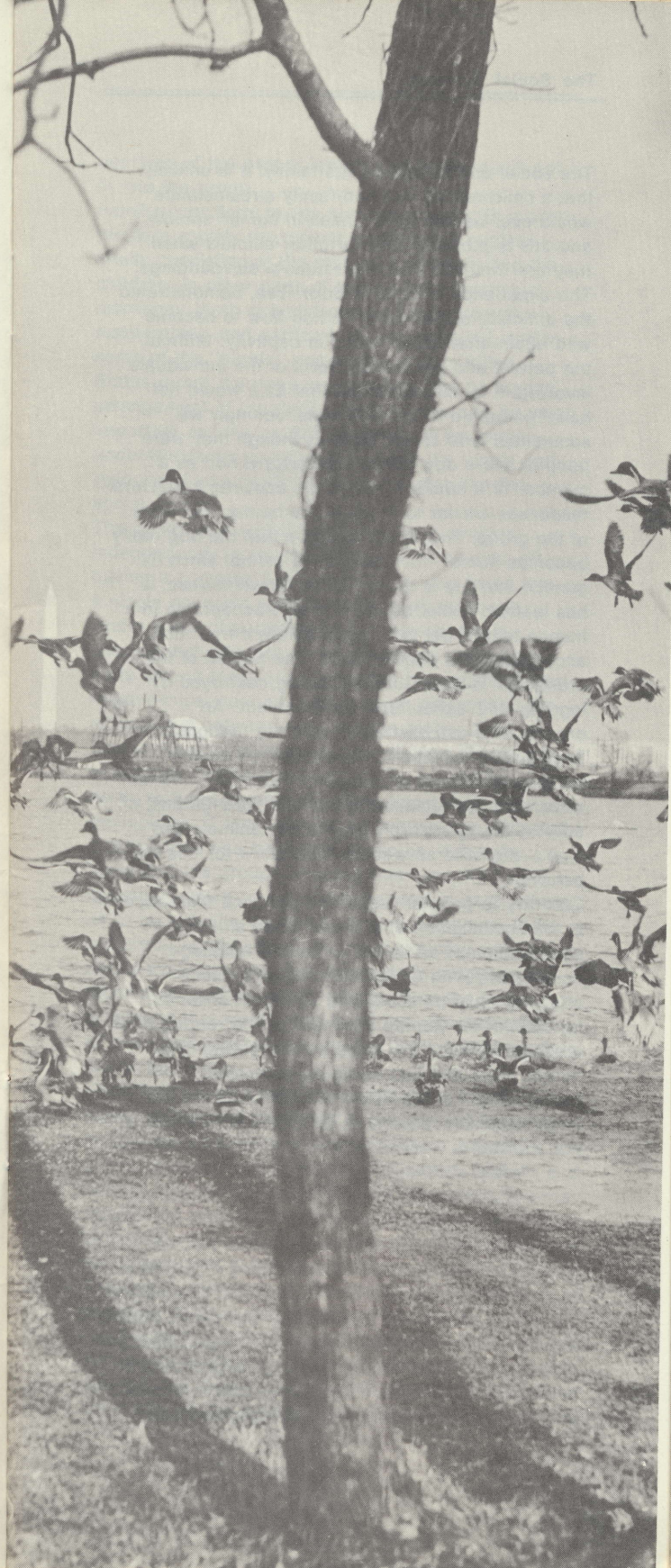
environmental shocks because they can evade them. The major environmental changes that allegedly accounted for demise of the dinosaurs are the exception, for apparently there was no escape.

The phenomenon of migration may be related to the notion of escape from environmental stress, although in the long interim in which the physiological techniques of migration have evolved it does not seem necessary to postulate conditions other than those inherent in the animals migrating. Plant migration, however, involves the life and death of the dispersing species and is not explained so easily on a behavioral basis but must depend upon a great deal of chance. It is a measure of the extreme prolificacy of plants that they are found everywhere they will grow.

From this we can see that environmental pressures have played an important role in the adaptation to community formation among biological organisms. Organisms that can endure and even flourish in a given environmental circumstance tend to remain in that situation; those that cannot, either migrate or perish.

The earliest form of man's biological community apparently was an adaptation to the predator-prey relationship. While certain vestigial organs such as the appendix indicate that man was capable of an herbivorous existence and still is with the proper choice of herbs, the record suggests that early man was primarily a hunter. However, this interpretation may have developed because the fossil and artifact record is easier to preserve and interpret than plant remains which often rot or grow into a new plant and are lost either way.

Most animals known, even social animals such as baboons or gorillas or elk, form mobile biological communities. They form associations that may be very complicated socially but their behavioral response to the environment evokes only the most passive attempts to modify the environment to insure their well-being and survival. In much the same way, man roamed the earth as a hunter, with a territory probably not much larger than that of a lion. When he built his first hunting camp he made a remarkable switch by adjusting his environmental circumstances to a stationary configuration based on a variety of functions other than food-producing or gathering. Man did not become sedentary in order to feed, grow, reproduce, and die in one spot like a coral or a sea lily. Men joined together for the many reasons associated with the creation of wealth.



The social unit for man is the family. It is unlikely that a child reared in a non-family circumstance would ever behave as a human in human society, and this is probably true for other animals when they are removed from their natural surroundings. The experience of Elsa, in *Born Free,* demonstrated the difficulty of "teaching" a lion how to become wild again after being raised in captivity. Without the patient and persistent efforts of the individuals involved, it is almost certain that Elsa would not have readapted to the wild state. Jokingly we sometimes refer to our dogs as though they were people, and a dog raised from puppyhood as a member of a human family often acquires behavioral responses similar to those of the human members of the group. This is not to argue that the dog really becomes human, for obviously it cannot since its genetic makeup is that of a dog. Nevertheless, it has learned social behavior that is acceptable in a human family, behavior quite different from that acceptable to a pack of dogs. The habitat of the orangutan in New Guinea is being destroyed by logging and agricultural development. An organization established to save the orangutan is finding that because the orangutan so quickly became socialized to man, their future is uncertain when they are released to the wild. Orangutans, of course, are by nature highly social animals and man's efforts to save them must allow for this social behavior.

Contrary to popular belief, the principal difference in the socialization of a human child and the socialization of an animal is not the language component. With or without language man's offspring must be socialized by him in order to function in the human community. The rearing of an elephant is much the same as the rearing of a human child and just as rigidly controlled biologically. For the first 6 months of its life the infant elephant remains at its mother's side and is not allowed to wander outside the circle of the herd. It is closely watched by the mother for about 2 years, and does not join the herd as a full-fledged member for about 11 years. The elephant's life span is about 60 years, so this development process roughly corresponds to the upbringing of a human in a similar life span. It should be noted that before the advent of sanitary engineering and public health, the life span of elephants was much longer than that of man. If behavior learned in a social grouping is necessary to function in the group, then it follows that an individual reared outside the group and deprived of the proper learning experience will not fit into the group.

Families can form in any number of ways. In modern Western society the typical family is the nuclear family consisting of the mother, the father, and the children. In other parts of the world polygamous marriages (both polyandrous and polygynous), matriarchies, and patriarchies can be found, and in some of the "hippie" communes of the United States group marriage is practiced. The particular arrangement of the family does not seem to be very important as long as each member of the family understands his or her status within the family and responds behaviorally in ways that stabilize the social group.

The family as a social entity may have evolved independently in several groups of hominoids, all having a common behavior pattern, who fused into a single coherent species millions of years ago. Under these circumstances it is reasonable to assume that different social groupings arose very early among these closely related hominoids. These relationships must have been much closer than the relationship between man and the higher apes.

Man is the only species, of several tens of millions of species that have existed on the face of the earth, to have developed a language-based technology. If language-based technology occurred in more than one biological grouping, it is very likely that the groups in which this capacity appeared would be so closely related to each other as to be virtually the same species. Moreover, if the pattern of family association and grouping reflects a social evolution, one that responds to language and technology and economic effects, then the social groupings that would tend to fill the requirements of biological survival may be the limiting factors of social evolution.

Nevertheless, wherever man exists he is found in a family setting and the family is the context in which he is socialized. Man is taught to live in a social group, to accept group values and norms, and to behave in a manner prescribed by the group. The concept of socialization simply means teaching the biological organism, in this case man, to live in a social grouping of his own species.

The family, therefore, is the primary biological grouping of man, and all subsequent social organization is dependent upon this fact. From the standpoint of the biological requirements for survival, the family unit provides reproductive continuity for the preservation of the species, and

for survival in a manner compatible with reproductive continuity. Moreover, the family unit gives social satisfaction beyond mere survival, for it provides for comfort, security, and well-being.

Other animal species may or may not be organized in a fashion similar to that of man, but the fact that family groupings are prevalent in most, if not all, higher animals indicates that it must be a stable biological-ecological configuration. This is particularly true during the formative years of the young when the number of lessons to be learned by a new member of the group is quite extensive.

In many cases the social groupings of animals occur only at seasonal times of the year and seem to be related primarily to reproductive functions. Moose seem to be loners except during the breeding season, and male grizzly bears do not associate with female grizzly bears except during the mating season. Their offspring may remain with the mother until the sub-adulthood of the offspring is reached, at which time they may be replaced in the social grouping by newborn. The social grouping then becomes that of the new offspring and the mother, who again form a relatively short-term stable association.

Since man evolved in the biological environment of the earth's biosphere, his existence depends upon his existence with other living things. Man's primary requirement for his biological and psychological well-being are other people and the natural setting of vegetation, together with the animals found there, i.e., birds, butterflies, rabbits, deer, and so on. All animals, including man, must be preoccupied with the gathering of food, and hence man's environment must also provide him with the plants and animals that constitute food. Since hunting is a basic elementary social pattern for the survival of man, it is not surprising that the excitement of the hunt still survives in moden society as a very strong social behavioral pattern.

In recent times it may appear that man has abandoned the concept of surrounding himself with living organisms in favor of the bricks and mortar of the cities. But places like New York and Tokyo are not merely bricks, mortar, plastic, glass, and steel; they are also millions of people. And further, prior to the development of food storage and refrigeration devices, large cities like London, Paris, and Peking must have teemed with plant and animal life brought to the city to feed the population.

The organization of any social organism automatically evokes a division of labor among the members of the social group. Among higher animals the sexes have different roles in reproduction, and the evolution of behavioral roles in the sexes may have resulted from differences in the controls of their respective metabolisms. The young in any social group are different from the mature members, and the young and the mature members differ again from the old and the very old in the group.

Differences in behavioral activities, whether work or play, arise from biological differences although they may be accelerated by other considerations. The problem of childbearing, for instance, is a division of labor which is prescribed by the differences in sex, but food-gathering and the consumption of food are biological absolutes. The problem of survival in hostile surroundings is a fundamental work activity around which divisions of labor occur for purely biological reasons. The social groupings of the baboon, for instance, indicate that certain social behavior is evoked when baboons sense that there may be trouble in their vicinity. As a matter of fact, baboons are known to behave cooperatively with elephants against their common enemy the lion. Increases in efficiency in the social groupings are sufficient reason to consider the long-term stability of man in groups. Since man's evolution must involve lower forms, as distinct from hominoids, and since man shares social organizations and social behavior in a primary biological social unit, it seems reasonable to think that social groupings are a biological property not just of man but of most higher animals.

As we have noted, man differs from all other animals in his highly developed language and technology. Early language was probably born out of animal communication. The variety of facial expressions, body postures, hand signals, grunts and noises, and other kinds of signals that are not truly language but which convey information among the group form a very important part of group social behavior. The simple acts of smiling to indicate approval and of frowning to indicate disapproval have significant effects on behavioral responses. The level of animal communication man shares with most of the higher animals is a set of signals, a set of noises, facial expressions, grunts, and postures that are group-related and that are understood by the group.

Early technology was probably related primarily to food procurement, i.e., the implements of hunting,

gathering and preparing food, skinning and cutting tools, scrapers and clubs, and similar kinds of primitive tools. The hunting camp may have been the first technical and architectural method by which man was adapted to group living. Along with his new hunting technology, man probably used caves or similar natural enclaves that could be made habitable and secure with minimum technical skill. As the group became more skilled at hunting and at defending itself, thus lessening the need for a secure habitat, structures such as lean-tos were probably located within easy access of the food source.

There is evidence that a significant evolutionary step in the development of man occurred when he moved to the grasslands to hunt. Under these circumstances he became more vulnerable to the large animals of prey, but by then he may have developed a technology sufficient to repel or to kill predators, and this, together with his security of numbers, would give him a wider choice of location for his hunting camps and later for his villages. There is some evidence that fire was used by *Homo erectus* as a weapon to frighten or kill animals as well as to cook and prepare meat.



Static Communities

Communities that stay in one place on an indefinite basis must have been formed for reasons other than food gathering and the security of numbers. In all probability food gathering itself would have promoted movement or migration as food was exhausted in a specific locality. It is reasonable to assume that static communities were formed to exploit a material that was prized by the hunting and food-gathering communities of man. In all likelihood, the substance of that material was not essential to biological survival.

If the compelling reason for establishing static communities was to exploit a resource in the neighborhood, then food requirements for the population would have to be imported into the area. This would inevitably bring about a division of labor in which those people who were exploiting the resource would not be compelled to gather food. The resource may have been a mineral that was fashioned into hunting and fishing tools, making it possible for hunters and fishermen to expand their food-gathering activities and increase their hunting efficiency.

Wealth is a function of knowledge plus resources and, since resources are essentially static, wealth increased as knowledge increased. The establishment of permanent communities was a significant milestone in development of technology based on information and language. It is at this juncture that man is separated from all other higher animals. At this point he acquired the concept of maximizing wealth production and could modify the environment for increased comfort, well-being, and security.

We find in modern man behavioral modes, ranging from basic survival to wealth production for its own sake. On the one hand, the Australian aborigines and the Kalahari bushmen live at elementary survival levels, and on the other, the Wall Street broker trades information in the form of wealth.

From Static Community to Urban Ecosystem

A city, then, is a blending of biological communities and the technological structures and devices placed there by man, and it has at least two functions. It must provide for the maintenance of the biological communities housed there, for the exchange of language-based information, and for the creation of wealth. If the demands of the technological aspects of the city ignore or overshadow the biological components of the city, the biological community suffers and will deteriorate. Conversely, if the biological components deny full expression of the technological development, the ultimate potential of the city is not reached.

The city as a biological community must have the attributes of all biological communities, and one of these attributes is minimum maintenance. There is no waste in a well-run ecosystem. So long as there is an uninterrupted flow of energy into a biological community it is a self-maintaining, self-regulating system. An ecosystem is stabilized as it acquires an increasing number of elements and a diversity of structural and functional forms. The greater the diversity, the greater the ability to use efficiently the inflow of energy. As an ecosystem or a biological community de-stabililizes, it becomes simplified, is less able to use the energy entering it, and therefore is less efficient. An unstable ecosystem undergoes relatively rapid change due to inefficient use of the energy flow. If one considers all the elements that support a city as maintenance functions, it follows that cities that are good biological communities will require the least maintenance and unstable communities will require more. There are many indicators to the stability or instability of the city as a biological community. Some of the more meaningful indicators can be found in the rate of infant mortality, the rate of school dropout, the rate of drug abuse, the rate of communicable disease, the number of crimes against persons and property, the number of people on welfare, the number of people unemployed and underemployed, and the degree of malnutrition.

The fact that a city needs urban renewal may indicate that it is a failing community. Urban renewal does not necessarily replace a poor biological community with a good one, but may only create an environment in which all the buildings are new in a neighborhood that is hostile to human life. Not long ago a skid row section of a major Midwest city was replaced by urban renewal. Prior to urban renewal the streets were relatively safe because there were people on them most of the day and night.

Furthermore, it was one of the few places in the city where an individual could be self-supporting on the minimum social security payment. The area is now a jungle of high-rise apartment and office buildings that must be guarded. The apartment buildings are locked and a guard must open the door for residents after 10:00 p.m. In short, a viable biological community was replaced with a technological conglomeration of buildings, some of which have won architectural prizes, that stand in an ecological no-man's land after dark.

Cities must be viewed as biological communities if man is to be happy in them. The cities will not be abandoned because they produce great wealth, but they need not be places of great technical achievement at the expense of the humanness of man. First and foremost, the biological needs of man must be provided. Commerce and industry must be placed in a matrix with the human community in a way that will provide a desirable and stable habitat. Properly run, cities should not be difficult to operate and maintain, for as well-balanced ecological communities they should maintain themselves. The economic benefits from cities can be significant by the most rigorous cost-benefit analysis, but if they are exploited for short-term gains they will be burdensome and costly to maintain and will bring into question their value and the desirability of perpetuating them.

The city is a crossroad, a conglomeration of human beings, a haven, or a jungle, but most of all it is a place where man the thinker shares thoughts with other thinkers.

Successful cities have retained their generalized biological forms and functions; those that have not have perished. Over-specialization has always been an evolutinary Achilles' heel, and overspecialization has caused the demise of many cities and has prevented many villages and towns from ever becoming cities.

In a simple environment with few complications man discovered that cities were a means of creating and regulating wealth. This concept was exploited so successfully that cities inevitably became the center of man's technological development. The wealth of the city was not derived from the commodities that were brought there, such wealth was in the mines, fields, and rivers of the surrounding hinterland, but the city provided for the system of creating wealth by giving value to things. Things become valuable because of what is known about them, or because of their location, or because a buyer for them is known, or a supplier of them is known. In short, the value and function of the city is to provide the means for men to communicate with each other for their mutual benefit. It was this communication that made it possible for commodities to change hands and for wealth to be accrued, spent, and lost thus increasing the probability of success and conferring value upon the commodity by incorporating it into the system. As soon as cities became financially more prosperous undertakings than hunting, they were built, destroyed, and rebuilt; established, abandoned, razed, and plowed with salt; burned, added to, and subtracted from. In short, the history of man on earth, once the city was invented, consists of experiments with the form, size, structure, function, and purpose of cities. From their inception cities have been located where people wanted to be, where they went for excitement, to gain their fortune, or to have a good time. Cities have functioned in essentially the same manner from the first built to the latest being built today. (Housing developments and suburbia should not be confused with cities. They are places to sequester families while making wealth in the city.)

The congregation of people with diverse interests interacting with each other and the ferment generated by the business of the city, namely, the creation of wealth, made the cities melting pots of human intellect and they have boiled out a stream of technology for which no end is in sight. This technology has steadily increased man's control over his environment and his insights into the operation of the universe, relentlessly created wealth, destroyed and exhausted resources, polluted air and water, and, for better or worse, has continued to increase logarithmically despite its long history.

The successful biological community, whether stationary or mobile, is capable of occupying a site or territory, of maintaining itself on the site or territory, and of reproducing itself there. It is a self-regenerating and self-renewing system capable of sustaining itself and extending its borders. It usually occupies the best sites in an area. The successful bioligical community is characterized by variety; variety of biotypes, variety of ages, and variety of functions, and it is controlled by dominant elements that provide its main aspect and its ability to interact with the environment. It includes a variety of other elements which survive and thrive in the environment created by the dominant elements. The elements of the successful

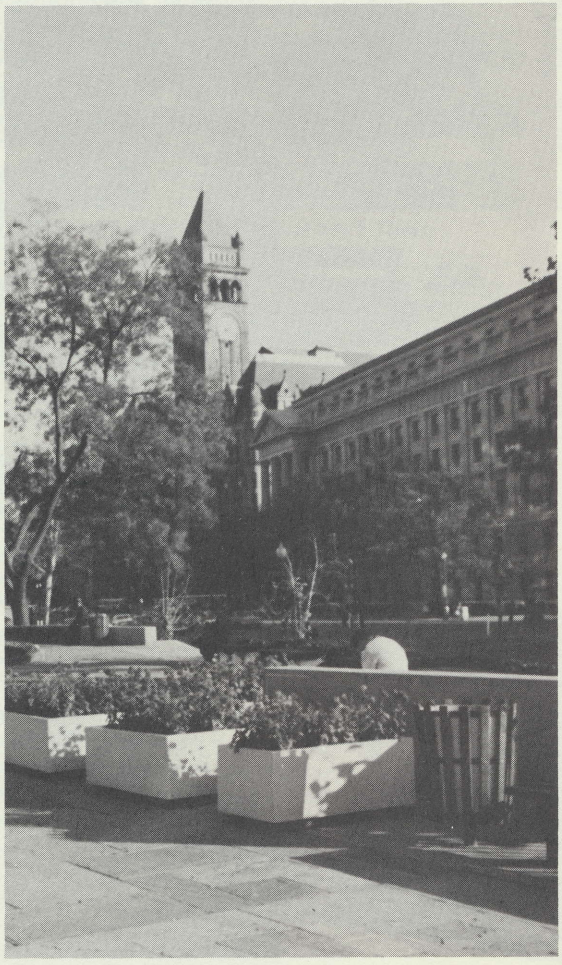
biological community reach their maximum development and stability through the replacement of unsuccessful or inefficient individuals, generally the aged or those no longer useful, slowly and over a long period of time. The elimination or destruction of dominant elements opens the community to newcomers and the space is usually filled by younger members with the same developmental potential. When changes occur in a successful biological community without seeming to alter its aspect, maturity and subsequent stability have been achieved. As long as the conditions favorable to the mix of elements of a mature community continue to prevail, the community will inexorably reproduce and renew itself.

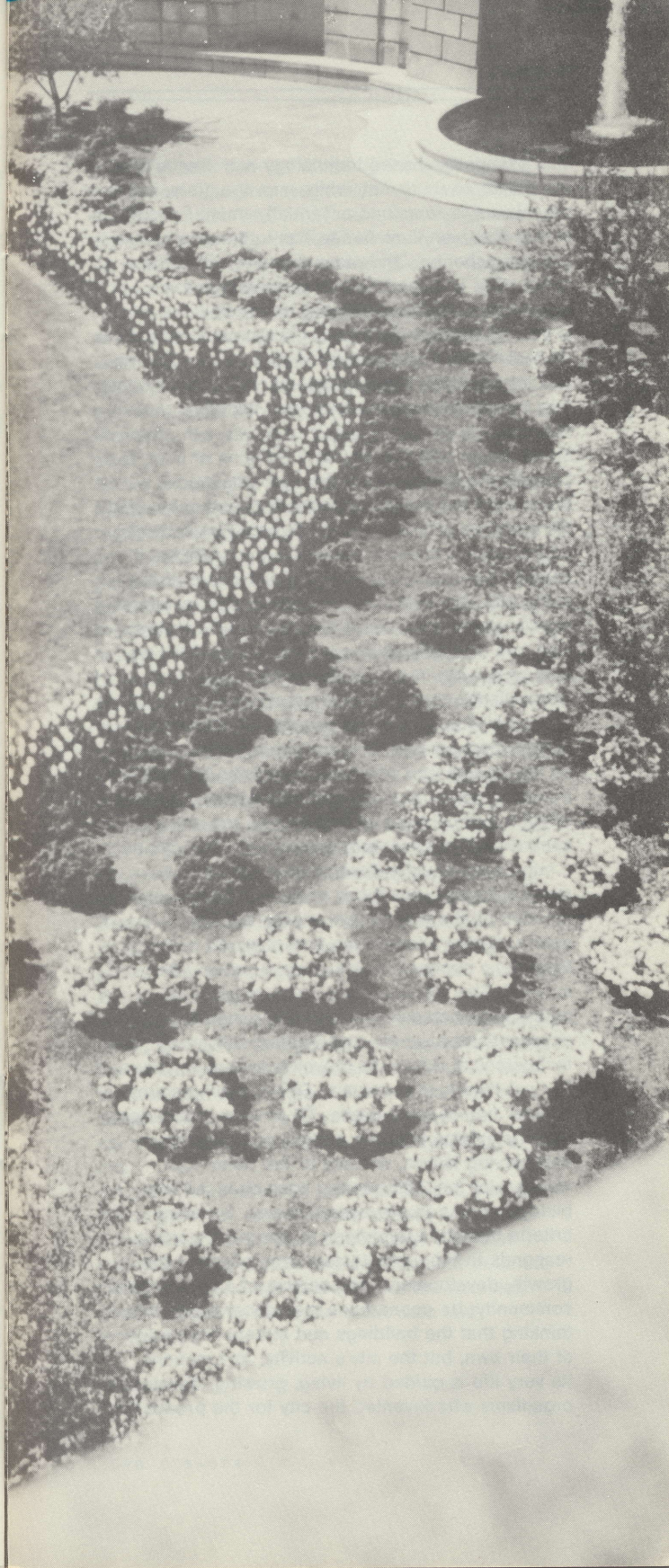
Cities have come and gone. On some sites there have been as many as seven to nine cities built one atop another. Some cities are brand new and some have existed from ancient days, yet each city with its living survivors is really a thing of the present. The important element is the diversity and stability of the city as it appears to its current inhabitants, for each new generation sees the city anew. How long does it take to assemble the elements of a thriving biological city? There probably is no single answer but many simple-minded indications. Kinship groups within the context of stable family configurations may take three generations to develop, and trees planted along the streets and rights-of-way take from 60 to 100 years to mature. The collective wisdom of the community bent on determining the most stable configuration of neighborhood through the mechanism of the creative activity of the inhabitants of the neighborhood may take 20 or even 50 years, and if the wealth-producing, interconnecting communications network does not form, the city may never become viable.

How long does it take for a newborn member of the community to learn enough about the life of the community and the city to participate in its activities? If all these factors are weighed with the time scale of human interaction on any level (getting to know one's neighbors, the grocer, the filling station attendant, the banker, wholesaler, broker, manufacturer, mayor, and local police officer) against the known rate of migration into and out of neighborhoods, the problem becomes quite complex. The simplest estimates tend to point to a long time. It may take 100 years for a city to



mature, growing and developing along with its street plantings. If properly cared for, the city should last millennia—not necessarily in exactly the same form and with each ancient element preserved, but in conjunction with new elements whose functional equivalents determine the biological viability because it is built into the system. A city should extend itself, but it cannot do so if it is infested with even-aged, even-sized structures having a single function and only partial diurnal-nocturnal occupancy and if great distances separate families from children and children from the city. The city has a life of its own, it has the biological energy and vitality of any biological system relentlessly moving toward its most stable configuration.





Summary

Man's language-based technology has altered his immediate environment, while man the biological organism has remained essentially unchanged. It is true that man lives better, has loftier goals, grander schemes, and plans that project further and further into the future, but modern man's environmentally-biochemically controlled behavior is little changed from that of his remotest ancestors. He feels elation and despair, happiness and sorrow, and knows truth, beauty, and ugliness. Conditioning may modify his responses but not his basic reactions.

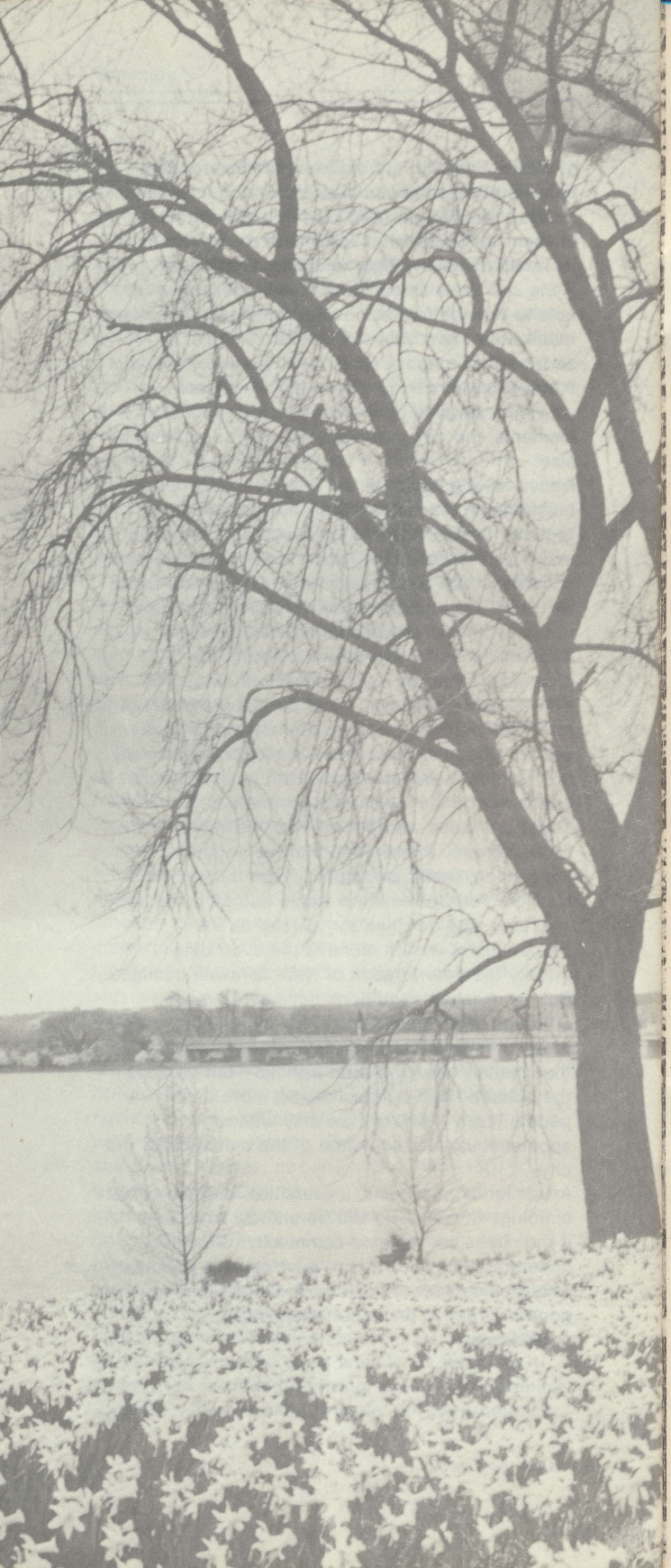
So we begin with the city as a creation of man, a biological organism who, through language, discovered the means of controlling and enhancing his environment. One of the ways that he controls and enhances his environment is by modifying it to suit his purposes and needs, and one of these is the city. The fact that knowledge plus resources equals wealth is a recent discovery, but one that man has probably always known intuitively. If we look at the city in its simplest aspect, we must acknowledge that its primary function is the creation of wealth. The sum of the people, the interaction of their diverse interests, and the ferment created by the trading and commercial activity adds up to a melting pot of human intellect that has made the city the fountainhead of technology, the arts, commerce, learning, and government. The city as a human community developed in response to man's activities, but it has never lost its primary function as the mechanism which, through communication, freed man from the trap of the limitations imposed by his preoccupation with survival. The city has come to be man's outstanding achievement and has generated unprecedented wealth and inspired the great technological advances of which we are so proud. But not lasers, skyscrapers, SST's, machineguns, nuclear bombs, split-levels, TV dinners, computers, color television, electric guitars, toothbrushes, and carving knives, nor any of the other 1001 wonders of the 20th century have changed the biology of man in any essential way. By every criteria the city is a biological community and it responds to the same factors that influence the growth, development, and demise of any biological community. Its appearance may deceive one into thinking that the buildings and streets have a life of their own, but the city's activity, its functions, its very life is guided by living, growing, developing organisms who invented the city for the production of wealth and who are aided by the speech-tool behavioral response mechanism of communication—courtesy of IBM and AT&T. And it is the human element of the city that will ultimately determine its health, viability, vigor, stability, and longevity. If the city loses its capacity to reproduce itself or fails to provide for the commonweal of its members, it will wither and ultimately perish. But if it is endowed with vigor born of diversity, with interlocking functions, and primary elements providing suitable environments for secondary elements, the city must thrive. It can do nothing else.

Above all, the city must be a place where human beings can demonstrate their humanity. This requires the opportunity for peaceful association and a built-in response network and environmental conditions that discourage violence and anti-social behavior and encourage individual creativity and progress. If man creates an environment that is basically destructive of protoplasm, the biological organism we call man will deteriorate via the very mechanisms that perpetuate him. But if the environment expands the horizons of his genetic potential, there is no reason to predict any end to the development of wealth and resources and the good life for everybody in the city.

There are those who believe that life in New York City is already intolerable; that the pollution, congestion, traffic, and crime make it impossible for New York to remain a viable human community. And they may be right, for as long as the production of wealth alone is the overriding priority the deterioration of New York will continue. But the existing conditions have set in motion autoregulatory mechanisms that are driving people away, and as large organizations leave New York the wealth-producing base shrinks—but so does the pollution and congestion. As more and more people leave New York we may witness a spontaneous autoregulation of the dynamics of the city.

Art galleries, museums, universities, and the tallest buildings in the world will be entirely irrelevant if the city is not a viable community. We must understand the growth and development potential of our cities and harness them for the common good in order to make our cities safe and prosperous.

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By using predictable behavior of biological communities, the basis for creating the city as a well-balanced ecosystem is possible at the present level of technology and knowledge. The biological process is an evolutionary heritage and the technical skill exists as one of man's great achievements. What is needed is an understanding of their relationship to each other, and *that* is urban ecology.

—*Theodore W. Sudia*

Urban Ecology Series No. 5

1974

PUBLICATION NUMBER: NPS-114

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