A CRITICAL SURVEY OF PUBLISHED PHYSICAL PLANNING PRINCIPLES

by

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7 Mellen Street
Cambridge 38, Mass.

May 23, 1955

Professor Frederick J. Adams,
Head, Department of City and Regional Planning
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Massachusetts Institute of Technology
Cambridge 39, Massachusetts

Dear Professor Adams:

I submit herewith A CRITICAL SURVEY OF PUBLISHED PHYSICAL PLANNING PRINCIPLES as my thesis in partial fulfillment of the requirments for the degree of Master in City Planning.

Respectfully yours,

Thomas A. Reiner

A C K N O W L E D G M E N T

I would like to take this opportunity to express my sincerest thanks to the entire faculty of the Department of City and Regional Planning. The past two years have been, for me, exciting intellectually, creative professionally, and thoroughly enjoyable socially. It is clear to me that this thesis has as background more than the last semester's work - it reflects information, attitudes and ideas which have accumulated during my studies at M.I.T. I know, therefore, that I have to acknowledge my debt to the entire department headed by Prof. Adams and to the two dozen or so fellow students with whom I worked.

Especially, however, I would like to thank Prof. Kelly for his many suggestions, his patience with my efforts, but especially for his persistence. Prof. Lynch, too, has been most helpful: I feel somewhat flattered by his interest as, in this thesis, I trample rather indiscriminately through the field he is cultivating. I think that whatever can pass for attempts at rigourous logic and analysis stems from studies with Prof. Rodwin, although I would take full responsibility for the many aberrations from the straight and narrow path he would have us follow.

Finally, I would like to thank Miss Beverly Graham who had the unenvied job to translate an impossible handwriting (often with grammar to match) into this typewritten thesis. She has been well introduced to that mystical design deity, Charrette. Requiescat.

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It can be done.

ABSTRACT OF THESIS

Title: A CRITICAL SURVEY OF PUBLISHED PHYSICAL PLANNING P RINCIPLES

Author: Thomas A. Reiner

Submitted to the Department of City and Regional Planning on May 23, 1955, in partial fulfillment of the requirments for the degree of Master in City Planning.

Objectives:

The object of this thesis is, first, to determine the sources and the content of certain physical planning principles and to establish on what assumptions and other bases these rest in order to assess these realistically. Secondly, this critical survey was conducted to determine the areas of essential agreement and disagreement so far as these principles are concerned.

Procedure:

Th e source material was a large segment of the planning literature published since 1895 and concerned with the whole range of problems, especially of a physical nature, which characterizes the contemporary urban environment. Given the synoptic nature of the field of City Planning, considerable attention was devoted to proposals for the ideal city.

The decision was made to focus on principles of the middle range between the levels of excessive specificity and generality. The critical survey centered on four interrelated areas: 1) The proposals regarding the over-all form of the city, distribution and relationship of use areas within the city, and the place of the city in the larger region, 2) the basic circulation pattern, 3) considerations of optimum size, and 4) the development of density standards.

The analysis was presented historically; within the four major periods of the last sixty years, the proposals were studied in terms of five categories of city form.

Findings:

The development of physical principles, of the whole field itself, shows maturity in their response to real and pressing problems. On the other hand, all too often there has been an unwarranted reliance on simple assertions, preliminary findings or sheer opinions, as well as unsophisticated excursions into alien disciplines in search of principles.

A large area of agreement was uncovered. In the literature, one finds the underlying assumption that there is a causal relationship between the physical environment on on hand and the social and economic life of the city and its inhabitants on the other. There is, secondly, considerable dissatisfaction with the city's physical arrangement which leads so often to social ills. A city, thirdly, is seen as composed of a hierarchy of units (with definited suggested limits for most of the levels); these units can be employed to improve social conditions. The city should also be composed of functionally differentiated areas. Circulation, too, should be 'zoned' by type, and is said to have uses other than simple motion, too.

Disagreement was found on the issue of compact vs. open development and the degree of independence or dependence units of a city should have. The proposals for optimum population per unit of a city show a variety of findings, sources, and assumptions. Similarly, many opinions exist on whether total city size should be limited or whether one should plan for growth. Density standards vary too, and often ,like population optima, have social reconstruction bases. Finally, there is the full range of form proposals and circulation schemes, each with certain characteristic advantages and disadvantages.

Thesis Supervisor_____

Burnham Kelly

"... one must dare to live a g a i n s t facts."

- E. A. Gutkind

"Nor shall my sword
sleep in my hand
Until we build Jerusalem
on England's green and pleasant land."

- William Blake

"Numberless crowded streets, high growth of iron, slender,
strong, light, splendidly uprising toward clear skies,
...
A million people - manners free and superb - open voices ..."

- Walt Whitman

INTRODUCTION

The aim of this thesis is to see what principles, susceptible to being put into physical terms, can be gleaned from a segment of planning literature. Such a study has importance beyond the fact that this kind of a historical review of the field is as yet lacking. Such principles (the meat of much planning activity),when put into effect, can profoundly change peoples lives. In the same way, the principles themselves reflect different views of the "good life". They are based on very definite assumptions. It is important, then, that the practitioner be made aware of the bases to these principles, that it be made clear which rest on firm foundations and which do not.

The method by which this study was undertaken consisted of a critical reading of published works offering a synoptic view of the city and of city planning. This has meant that works dealing with the ideal city, the city region and a well defined area such as a neighborhood have received the major share of attention. The underlying assumption is that in such works we can find the interrelations which so characterize the field and be able to criticize the works more successfully. Furthermore, the ideal city has served as a model in town planning as a vehicle of expression of the acknowledged leaders in the field just as Utopia served as a means to express thoughts on human nature and political economy.

We have tried to follow a very simple form in this analysis. First, the authors were grouped into four major periods. This was done rather arbitrarily and simply reflects the main socio-economic periods of this century. A decision was then made as to which major form category the

proposed plan most closely resembled. The form considerations (contiguous, satellite, linear, poly-nucleated, or neighborhood) were selected because these were the lowest common denominators of the schemes studied. While this was done solely to make some continuity in presentation possible, any other taxonomy would be relatively hard to handle.

The next step was to present the principles of the authors as they saw them. We have tried to analyze the source of the design and make clear what assumptions were made, explicitly and implicitly. These were then analyzed, both regarding the individual points and their mutual consistency. The critique was directed both on the level of what relevance the principles have today and on their contribution in a historical perspective.

The analysis was limited to what Merton (1949)* has called "theories of the middle range", principles between the too high and the too low level of generality so characteristic of city planning (as well as much of the rest of the social sciences). A principle of low generality would include, for example the frequent allusions to optimum street widths. The other extreme would be the oft stated injunction that the city must reflect the period in which it is built or the wishes of the people. These types of "principles", at both extremes, trespass on other disciplines. They also fail to be really useful to the planner faced with the necessity of chosing between realistic alternatives. Principles of the "middle range" should satisfy certain criteria.

First, they must have been devised with knowledge of what the concern of the field of city planning is, that is by and for planners. Secondly,

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*Numbers in parentheses after an author's name refer to the publication date of the references listed in the Bibliography where the works are arranged alphabetically by author and then by date of publication.

the principles must have general applicability, and the authors intended them to have that. These first two provisions reflect something of an ad hominem fallacy, but the author's background and aim were considered important both to limit the number of sources and to avoid the criticism that too much was "read into" certain designs. The next characteristic of the principles selected was that they have limitations as well as a general applicability. That is, that they dealt with a limited class of situations, for example; that a given form was appropriate to a city in a certain size range but not in another. Finally, we have dealt with principles which are at least partly normative and not entirely descriptive. This reflects not so much the choice of source material (which often is both), so much as the belief that a study of normative principles would prove more useful. Such a study is also more susceptible to critical analysis resting on internal evidence, as compared to a critique of descriptive principles which would require considerable study of empirical data.

Principles must, of course, have a substantive content. The very breadth of the field of city planning, however, requires that their analysis be a limited one. The criteria of choice employed were that the principles which in some form could apply to every city, and that they dealt with physical conditions. That is, the choice is limited to a group of principles which have meaning only when considered together: the total population of an area and the density, for example, are not separable. Neither can one logically conceive of a city which lacks these attributes.

The four areas of concern selected are: (1) the form of the total city. This includes relation of parts of the city to each other, and the

place of the city in its region - its relation to other parts, (2) the circulation system, (3) considerations of optimum population, (4) considerations of optimum density standards.

THE SURVEY

The discussion can best be conducted if development be traced historically and within each period, by looking at each of the basic forms with which the synoptic writers have concerned themselves. We have grouped the analyses into four periods. The first brings us up to the First World War. The second is a period of considerable growth in all parts of the world and covers the years 1918 to 1929. The depression 'thirties constitute the third period period which ends with World War II. The fourth period, the one which brings us up to date, begins with works looking to the post war period.

Six categories present themselves in two main groups. First, we note studies of the city and its immediate region; secondly, detailed investigation of the cells, neighborhoods, communities, centers, or what have you, of which the city is composed. The former category, for the purpose of this study, includes proposals for: (a) the closely massed central city, regardless of the shape, one where the developed parts are contiguous, (b) the dispersal proposals, with particular emphasis on the small town, often dependent on a nearby metropolis, (c) linear city theories, and (d) the poly-nucleated metropolis. The neighborhood form is not susceptible to a similar breakdown, and consequently, proposals are discussed in one sequence.

The procedure shall be to present brief outlines of the form theories. Emphasis will be placed on the source of the idea - either the authority or example of another writer, individual research or logical conclusion, or simply statements not backed up. In this manner, we shall

arrive at the few truly original and separate proposals and be better able to assign credit for these and categorize them. It is, however, important to note that only written material and published designs are available for this thesis; hence, almost inevitably, undeserved criticism will be leveled against certain authors on the grounds that they failed to support their arguments.

PART I - PROPOSALS BEFORE WORLD WAR I

Before turning to individual analyses of ideal cities, a word must be said to justify the line drawn between the utopias and social reconstruction proposals and the first of the true planning proposals*. There must be, first of all, a recognition of modern industrial way of life and of transporting goods and people. Secondly, and this, admittedly, is somewhat hard to delineate precisely; the design should reflect planning principles as we have discussed above.

The Massed City

The first writer who can be considered a modern planner is one Theodore Fritsch, a German of whom very little is known. His original edition of Die Stadt der Zukunft appeared in 1896; in 1912 he republished, complaining that no one acted on his suggestions, but that the garden city movement, grown strong in Germany, drew nourishment from English experience and literature. He as much accuses Howard of plagiarism and bemoans the fact that an idea, to be accepted in Germany, must needs be foreign.

It is worthwhile to dwell somewhat on his book, for in 1896, we already see most of the significant arguments current in the field today. He states the principle of zoning, holding that reason in environment

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*The"historical utopians", and their social-reconstructionist followers, lacked imagination and frequently consistency in describing their ideal city. As a class, these are tightly knit cities with well-defined boundaries - possibly the heritage of the medieval wall. While these proposals realize the relationship of town to its surrounding region economically, only Buckingham's Victoria, through outside placement of industrial estates, uses the surroundings in a positive way (Adams, 1906, Mumford, 1922, Tunnard, 1953).

leads to reason in society and individual (an anticipation of the school of ecological determinists) and that zoning can provide an economic, convenient, and safe distribution of use. Just as land uses are to be zoned, so are traffic uses with heavy trucks limited to the main arteries and basement-level delivery routes, and wheeled vehicles to local streets. Pedestrian traffic is encouraged to use the inner pathways of what are actually superblocks with green areas inside. His land use pattern, he hopes, will further discourage heavy traffic from use of center streets.

The city has essentially a ring pattern with civic and commercial uses at the center; various residential bands surrounding this. The richest are furthest inward - the price of accessibility is high; the poorest live in the outer ring to be closest to the industry which is the major external land use preceding the greenbelt. Wedges of green penetrate the city, and the amount of open space is to be proportional to density.

Fritsch is very interested in giving the city an organic character* and he wants to achieve it by a rather "gimicky" approach to growth. He

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*The adjective "organic" reappears frequently in the literature. It is used loosely all too often. It seems to incorporate three concepts. These can be mutually exclusive.

1- To describe a system whose component parts show a considered and acceptable interrelationship. Thus, organic growth is growth by parallel development of component parts. This is the sense in which Fritsch uses the term.

2- To describe a system which shows a process of growth whereby a satisfactory end results over a long period of time and in consequence of a large number of discreet individual choices. Saarinen, 1943, and Tunnard, 1953 would seem to hold to this viewpoint. (Saarinen adds that an organic body possesses a continuity and life of its own; Tunnard specifically opposes this idea with its dangerous consequences).

3- Organic is also a rather loose adjective implying natural, often amoebic-like or cell-like in shape. In contrast to a rectangular grid, the medieval street plan was "organic". (Hilberseimer, 1944, among many others, uses the word in this context.

recognizes that no city reaches its full size before a long growing period. And he also implies (though does not state outright) that one of the shortcomings of a ring pattern is its essential inflexibility once maturity has been reached. He proposes that instead of the obvious and historical growth pattern from the center outward, the town should begin growing along a base line and then conch-wise with concurrent growth of each activity. If, in the course of centuries, the full circle is turned, the city still can bypass the by now historical core and continue its growth at a metropolitan scale. He suggests that this system is more flexible, that band widths can be varied as changing times bring changing demands for land use. This justifies his essentially radial road pattern.

In terms of our present-day public philosophy, we must take issue with Fritsch's class-differentiating bands. However, in contrast to subsequent proposals such as Garnier's, he at least places industry close to those least able to afford transportation to work. Fritsch separates workers' residential areas from factories by a thin greenbelt - probably too thin for our liking (no wider than some boulevards). While each of the communal, public, or business uses is at a logical point, they seem to be unnecessarily atomized. In addition to a main axis taking up perhaps 20% of the town area, along which Post Office, schools, the shops and the civic functions are strung out, there are still the railroad stations, the sports grounds, and festival areas in other parts of the city.

The main gap in Fritsch's presentation, however, is the absence of consideration of density. While his pattern of growth implicitly suggests that he does not believe in any one optimum population, the failure to speak of any population makes a critique of the amount of industrial space

difficult, and analysis of such matters as the apparent superabundance of railways difficult.

To summarize, Fritsch's study presents an acceptable if rather unique approach to the problem of growth, he understands the desirability of land use zoning and protection of residential areas, presents an early and thought-out analysis of green space (wedges), and goes far in separating different traffic systems.

Tony Garnier's Cite Industrielle was conceived during the first decade of the 20th century. It is designed with a particular site in mind, and just as utopia historically was largely a vehicle for the expression of the author's view of human nature, so Garnier's Cite was largely deveoped to give vent to his architectural ideas. It is, as a consequence, all too easy to pick out the relatively fatal flaws.

But first the positive side: main use areas (residential, working and health) are well separated by swaths of green, their location vis a vis one another and internal orientation is largely determined by consideration of sun, wind, and site. Parenthetically, consideration of these orientation factors becomes inherently difficult for all radial systems and is probably least complicated by a linear system. Garnier adopted the gridiron system for his local street pattern, with the main axis laid out to take advantage of the sun. The rigidity of his system is ameliorated by provision of pedestrian walks in block interiors.

The town size chosen is 35,000, but this does not seem to be nominative but rather an observation that this was a reasonable size for industrial centers. As evidence that the figure chosen is not really impor-

tant to him, we note the extremely ragged boundaries to his residential areas. He is far more positive on the issue of density. It seems that his was essentially an architectural approach: the lot size was determined after the house was designed. Uniform lots 15m x 15m divide the 30m wide blocks of the city, giving an overall residential density in the 20F/A range - twenty families per acre - in the living areas (the bulk of the population lives in free standing 1F homes). More generous land allowance is given to homes for the managerial class. They are placed in an area which interestingly enough has no gridiron plan.

The main center of the city is strongly expressed. Ample space and vistas are provided, and, as everywhere in the plan there is shown an amazing prescience of modern technological and transportation developments. The subordinate center (the commercial distinguished from the main cultural and administrative) is off-axis and on the railroad line. The magnificant boulevard, the main axis, joins these two parts. Schools - again amazingly up to date - dot the residential areas; perhaps 4,000 people per school. However, there is no mention made of a neighborhood idea. Presumably, the total extensive social, cultural, civic, and recreational life would take place in the center, just as all the shopping would be done in the one commercial zone.

This points out the scheme's main shortcoming: the failure to recognize the time-distance factor. The worker lives several miles from his work. While the managerial class seems to be rich enough to dwell near shops almost at the factory gates, it is as removed from town activities as the worker is from his work. The housewife must travel as far to do her shopping. Arrival and departure is by the far-removed railroad station.

The ubiquity of green spaces is one compensating factor, another is the advantages of residential areas kept free of non-conforming uses, traffic (or even smoke or noise). Then, although this purports to be an industrial city, no discussion of the economy or of economic considerations is made. It is not surprising, then, that about 50% of the built-up area is devoted to industry. It is more like a catalogue of possible industrial types than a realistic scheme of work and production. Finally, we must again question the desirability of class districts.

Dispersal Proposals

While Ebenezer Howard, (1946), writing in 1898, has much in common with Fitsch, his importance, as Osborn writes in the introduction to Garden Cities of Tomorrow , lies in his central idea that "the size of towns is a proper subject of conscious control". With that to start with, Howard proposes a relatively compact town with a ring pattern. The public and similar facilities are concentrated. The broad boulevards and proximity to "real" green on the outside make other green areas, such as wedges, unnecessary. When saturation is reached, new towns, separated by something like three miles of green, are established. Just as the garden city must be more than a suburb and be separated from the core, the greenbelt around the town must be kept inviolate.

Internally, we see the introduction of a new concept - that of the neighborhood ("wards") - one is tempted to conclude that this followed from the relatively rigid street pattern: a radial pattern with two strongly articulated rings. Again we see the attempt to keep heavy traffic to the outside ring.

This trafficway and industry ring, rather than the greenbelt, would seem to provide the real block to expansion and should, given the desired municipal ownership of land, help to keep the population to 32,000. This population ceiling would give a neighborhood population of approximately 5,000, with a school in the middle of the ward. Most other communal facilities are grouped together at the center of the town, at the tip of the ward, in this anticipating Perry's (1929) theory of the neighborhood. No public facility (railroad station excepted) is to be further than 1800 feet from a residential area - or well below ten minute's walk - what subsequent writers call the "human scale" is built into this town of approximately one and one-half miles in diameter.

This, of course, is achieved through relatively high density residential development. It is interesting to note that one of the current lines of opposition to the New Towns, Howard's, "Grandchildren", lies in their excessive openness. Yet he foresaw densities in the residential area of seventy-ninety people per acre, or an overall city density of thirty people per acre. Howard does not explain or defend his choice of total population and density. His scheme of presentation is to act as a visitor's guide to an existing town.

Howard is held in high respect for his ability to synthesize so many aspects of the good urban life (see Mumford (1946)).The source of his figures "30,000" and "70-90/A" probably came from a judicious weighing of financial capacity of the inhabitants, distance considerations, and such less definite factors as working force, etc.

Linear Cities

The period before the First World War saw the development and culmination of thought in a quite opposite direction: the linear form. Like the previous examples, they sought to provide a more livable , convenient, and healthy environment for city dwellers. The extreme in the "primitive" linearists came when the linear city was to substitute for the city. In general they sought the advantage of limitless expansion. Whether this is a liability or an asset remains, of course, an open matter.

The Madrid linearist (1911)(Soria el Mata began writing in the early eighties) saw this proposal both as a tentacle of an existing city and as a link between existing nuclei. Agricultural and other open tracts of considerable size are left between these strings of development and as in the case of other satellite town proposals, a close relationship is envisaged between city and country (more use of green areas for recreational purposes and for more intense agricultural purposes, a better life for farmers as they live in a"city"). The form of the city is determined by the main artery, with its rapid transit line, through traffic, local ways and planting strips. Buildings face the roadway, and extend one or two blocks back. Designed in an era of advance in transit facilities, and decreasing liability in crowded cities. This shape was developed with optimum communication and salubrious environment in mind. There is a half-voiced assumption that each section of the roadways is as good as the next - this is reflected in the almost random dispersal of cultural and commercial facilities.

This points up the first major contradiction of the system. There must be some clustering of facilities, etc. (an even spread of non-residential uses is inconceivable in view of the narrow band of development) which would defeat the idea of equal accessibility. Yet an absence of focus would likewise be tiresome and inconvenient.

Regarding transportation: we now look upon proximity to major traffic routes as a hazard and liability rather than as an asset. We also recognize that roadside development, such as along the main artery, impedes the very plow which is the city's raison d'etre. Furthermore, with increasing use of roads for long distance travel, we tend to stress roadside scenery. Of course, these considerations could hardly have been anticipated half-a-century ago. They have resulted in a reorientation of linear thinking to produce forms discussed later.

Some further, though perhaps relatively minor, criticisms can be made. Inadequate consideration is given to the location of industry - one might say that this linear system maximizes distances to any one point rather than minimizes them. Likewise, the square feet of roadway and linear factors as major mains is increased by the linear form; and utility systems depending on pressure or gravity flow, are at a disadvantage here. Finally, no consideration is given to what an optimum length of the units should be. It seems that at a certain length, a point of no return would be reached. This could depend on distance between stops on major rail lines or reflect utility and street costs. Similarly, no consideration is given density, though drawings suggest acceptance of typical suburban development in the four-twelve houses per acre category.

Meanwhile, in America, Chambless (1910) carries this to an extreme. "Roadtown" is, in reality, one snakelike building stretching over hill and dale: freight and passenger rapid transit and utilities in the basement, row housing of twenty foot width above, and a promenade-roof garden-playground on top. Schools, shops, industry provide an accent to the building; these are interspersed when and where needed. "Roadtown" provides the tie between city and country by bringing the two together. It is an attack on the waste arising from transporting and distributing, and on the unhealthy city life. Paralleling the physical plant (a rational "skyscraper on its side") is a reorganization of social life.

Chambless provides rather convincing evidence that the time spent in traveling would be less than in any other form then existing; however, the rapid transit he envisages is not tied to a city form as he describes (except that he claims an economy in having only one foundation-and-roadbed construction.

As he puts it, the efficiency and acceptance of his system rests on a relatively emotional level; it seems that in the absence of more up-to-date cost data, the matter will have to stand as is.

The Neighborhood Level

There still remain for discussion two schematic approaches from the pre-war ear. The hexagonal grid will keep on reappearing - Cauchon in the twenties, and Humbert in the forties. Inigo Triggs, writing in 1909, refers favorably to two proposals: those of Adolph Muller and of Charles Lamb. While neither is a discussion of the total city, to which we have intended to limit ourselves, they are sufficiently broad to warrant attention.

Muller, an Austrian contemporary of Triggs, introduces what amounts to a superblock. These are arranged so that they are separated by relatively open triangular spaces. Communal facilities are generally located in these triangles and in the center of the residential hexagon. Straight thorofares are possible in this design, and the same triangles which permit this also provide changing street vistas.

One wonders, however, if a street system, where only one half the street is really utilized, is an economic one in such prosaic matters as utility length, square feet of roadway per dwelling unit, etc. This is even more important when we read that up to forty percent of the area in Muller's scheme would be devoted to streets. Of course, not all the thoroughfares need be as wide as the splendid boulevards he has designed - there is no reason why variations should not exist. Yet the figure will still remain inordinately high so long as only"half streets" are retained.

The system does have advantages in providing ample open space. Unfortunately, the playgrounds, parks and public buildings sited in the triangles are surrounded by major traffic ways. At least Muller fails to suggest that they might suffer from this. The hexagonal blocks themselves possess large green areas, with schools, gardens, or museums on the inside. Access is only by foot. The arrangement as presented would not frankly be acceptable to contemporary society: it is far too rigid and of doubtful amenity. (There are questions of unpleasant orientation for one-third of the houses, narrow alley ways, etc.).

One scheme when applied at different scales can deal with fundamentally different problems. A hexagonal grid can be applied at the

level of the individual block as Muller's was. It can, as in the case of Lamb* also be a much larger system assuring the most direct communication between regularly spaced centers. But his real importance lies in what to him probably was a side issue: that these centers are concentrations of separate activity. He recognizes the tendency of similar services and occupations to gravitate one to another, and each group is almost a self-supporting city with residences, schools and shops for its employees. It is separated from its neighbors by a park. In this, he anticipates a series of writers from Gloeden to Stein, and presents a system quite opposed to that of a Tony Garnier, who, although he provides sharply defined work centers, does not tie these together with the immediately surrounding residences. We shall present a more detailed critique of this type of approach when we come to consider Gloeden (1923). At this point, let it be said that such a proposal runs counter to current family life (where different members work at different jobs) and fails to recognize varying spatial requirments of industrial and commercial functions.

The transportation scheme itself, however, is rather senseless. As proposed, the highway net would cut up into six pieces the all-important centers. So long as the surroundings hold the residences, they too are frequently intersected by the main roads. And finally, the trafficways intersect at the points of highest concentration in the center of work areas. In reality, there is no convenience for through traffic.

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*Unfortunately, extensive research failed to disclose the source of Trigg's information on Lamb or even a trace of Lamb in any earlier publication.

PART II - FROM WORLD WAR TO DEPRESSION

The First World War provides a convenient breaking point between the first and second period. No plan that followed it could ignore the impact of modern technology and especially of vehicular traffic on the urban scene*, none failed to express the author's political philosophy. It is no exaggeration to say that the bulk of writings are the three dimensional expression of varying degrees of social democracy. In this period, we find the first real studies of a city composed of "ready made" standardized parts. This certainly reflects the new production techniques. This approach finds its culmination in Perry's Neighborhood Unit at the end of the period, 1929.

The Massed City

Writing in 1920, Kern and Geschickter were interested in planning for a city which would experience a considerable and a largely unpredictable growth. The first step is to divide the city into two main areas - living and service, and separate these by the main straight traffic artery. Then, expansion could take place both depthwise and laterally, while the unlike functions of a city are kept separate. On the south side, a rather spectacular Burnhamesque civic center sits in the middle of two large industrial areas; on the north, the residential section with local facilities.

The residential areas are composed of an unspecified number of relatively uniform neighborhoods with an optimum number of services provided

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*Triggs, writing in 1909 has some charming chapters on traffic control - probably the first comprehensive attempt.

for a wholesome community life. In each neighborhood, four long rows of tall apartments fill the 1200 x 600 foot area and are placed north-south for orientation reasons. Gardens separate these, and in the center a long, low strip provides space for schools, local offices, dining halls, and other community facilities. The authors suggest the plan will provide a quiet, self-contained community life for the 7000 people living in the eighteen acres - a density requiring eight or ten floor buildings in this case.

One noticeable ommission is the absence of consideration for public or private transportation. Fortunately, Kern expands his plan in a book written several years later (Kern, 1924). Electric buses and on more important routes, electric railways run under the "servisorium". Private cars can go along this route, but they would be discouraged - use of public transportation is to be made more convenient and more pleasant. And the provision of so many facilities in the "servisorium" will make much travel unneccessary. Garages are under the main boulevard. For very rich, the basement of the residential units (the "resiances") can be converted to roadways and garages near elevator shafts. As is, the basements have a small delivery railway for packages and space for utilities. In this way, the residential structures,placed in quiet and green areas protected from traffic,would provide ideal amenities. Though no credit is given, this sounds like a segmented "Roadtown".

From today's perspective, we must question the disposition of traffic and of traffic ways. But neither the theory nor the design would suffer if main roads would separate the units, leaving public transportation channels to run under the service centers. More important, we must

question whether such an abundance of community facilities can be justified - no attempt was made by Kern to discover what proportion of income, for example, would be spent in the locality. While he proposes a large shopping center "downtown" (perhaps too large) he states that the more that is done locally the better. If he is successful, one wonders how one can justify financially the rather expensive downtown center, if not, how to support the local "servisoriums". At any rate, the cost of placing the entire communications net underground would be extremely high. It would seem that a total new system of economics would have to be developed to measure gain vs. expense - and the author fails even to suggest the need for such an approach. Finally, if the community is the essential unit, he fails to justify in any way the original figure of 7,000 or the revised estimate in the 1924 book of 8,000 or 9,000.

Comey (1923) is also a determinist: cities have to grow and cannot be stopped from growing. He uses this as an argument against the English garden city with its stable population*. His is essentially a core city, with linear expansion along radial routes joining a hierarchy of centers, sub-centers, etc. Density and intensity of activity reflect land values and are greatest, therefore along and especially at the intersection of major routes. The major routes are surrounded by industry, then a business or parkway band, then come the residential areas, and finally the agricultural belts, which he hopes will give all the advantages of the garden city. Most people are expected to spend their days within the communities - shopping, industry (jobs) and recreation all are provided there.

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*This is hardly a fair or logical argument since one of the raisons d'etre of the garden city precisely is to take care of growth - and planning for growth.

But again we must ask, how can one justify an extremely complex and to all appearances expensive transit system if the entire design scheme, and the efforts of the economy and the community are devoted to producing essentially self-contained communities (really bands here). Then, some of the criticisms of the linear city apply here too - the use of main thoroughfare by local and through traffic for example (or, put another way, use of an expensive utility for all purposes to serve all users when a less expensive one might serve some users). And again we must question whether concentration of activity at main route intersection would not be self-defeating acceptance of high land value principle notwithstanding.

Noulan Cauchon (1927), a Canadian planner writing during the twenties, proposes a city based on a hexagonal street grid. It differs from the previously mentioned proposals in that his Hexagonopolis is a plan for a whole city but one which is relatively one-centered, not polinucleated as the earlier proposals were. Furthermore, the honeycomb pattern goes to the block level while Lamb's proposal was essentially radial below the neighborhood. One hexagonal system defines the "wards", about one hundred hexagonal blocks make up the one-mile wide ward. We gather from the one example offered that the three acre blocks have a density of about twelve dwelling units per residential area acres.

Efficiency of transportation: that is the goal. The system was devised to minimize congestion and interference; a three-way intersection, Cauchon holds, does this better than the standard four-way crossing. Furthermore, since a hexagonal grid has three basic axes, the traffic can be better diffused. He ascribes other advantages to his system: greater

visibility on corners, shorter length of road (and other linear factors) per block of a given area, and many fewer collision points at each intersection.

The writer claims his design is best suited to connecting points in the city. One wonders then why he feels it necessary to superimpose two larger grids of straight streets and arteries. These require in the former case yet more complicated intersections (six way) and very odd shaped blocks, in the latter what must be expensive depressed highways. It is also significant that when he comes to non residential areas as the business and industrial zones, he abandons the hexagonal grid altogether and reverts to the small rectangular block system.

Le Corbusier,in a relatively early work (1929), stresses the core. Modern civilization, economy and culture depend on an efficient and accessible city center. But industry has quite opposite demands. Therefore, remove manufacturing to satellite towns, and have the working population live near their jobs - near the center or in garden cities, as the case may be. The principles for planning a contemporary city is to decongest the center, and to increase the real density, so as to "bring about the close contact required by business". This can be done while increasing means for traffic circulation and providing generous green and other open spaces.

The transportation system is described in considerable detail - and well it might be, for the large distances, say to sport fields, show how obviously the city depends on circulation. The main grid 400 x 400 m results from calculating maximum convenient walking distance from the rapid transit stops at the blocks' center and the wish to pull the main routes as far apart as possible to cut down the number of intersections.

Le Corbusier is in step with his time when he proposes vertical separation of trucks and pleasure vehicles*. The main super highway forms a cross around which the metropolis' center is built.

Though he claims to plan for a density no more excessive than that existing in twentieth century Paris, his forty acre blocks are built for 6,000 to 50,000 residents - the higher densities are closer in to the center. Outside of this central area, the density falls to 120 people per acre. No figures or elaborate description are given for the outlying garden cities.

A very important contribution lies in the consideration of daytime density in business areas - thus, the skyscrapers are planned to carry 1200 people per acre. Though his roadway system may carry this, it is interesting to note that the parking provision is quite inadequate for such a daytime population.

One can take issue, however, with the intention to concentrate traffic so heavily in the center. Not even the pictured twenty-lane highways could efficiently distribute the flow, and one may well wonder whether concentration is worth the cost of multi-layer circulation. The extreme separation of industry from the city and the two types of residential areas created are of dubious merit. And, of course, today we do not accept the necessity of proximity for business as unequivocally as Le Corbusier did. But he himself changed his ideas and we shall meet him again.

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*See, for example, Janko's (1925) "Safetown" - a proposal for two-level grids with the intersection of the pedestrian grid in the center of the vehicular grid and one floor higher; the buildings sit in the spaces between.

Dispersal Proposals

We now turn to the non-metropolitan proposals; the development of relatively small towns set in a rural environment seems to be an English concern during this period.

A series of essays by 'New Townsmen' (1918), written at the close of the World War, presents the usual sad picture of life in town and country as it then stood, and speaks of the need for a new synthesis: the garden city. The rest of the work is an attempt to discuss in more concrete terms Howard's principles. The question of form does not concern these essayists. A round town is assumed to be satisfactory. This is an interesting example how a schematic diagram (so popularized as Howard's no doubt was, at least in this circle) can become interpreted for more than it was intended. The surrounding greenbelt is very important: to keep other cities at arm's length, to bind town and country together, and to limit city size once the maximum has been reached. As a rule of thumb, at least three times a town's area should be devoted to agricultural purposes*.

The basic question, according to this book, is how large the town should be. The reader feels himself on the threshhold of a dramatic discovery, only to find himself face to face with the usual suggestions:

1. A population large enough and only so large as to provide the employees needed "to permit full division of labor in production and distribution..."
2. A population large enough, and only so large as to provide an efficient scale in the provision of amenities, facilities and services.

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*It is not clear exactly what happens when a constellation of garden cities is built. Is the greenbelt to be three times the size of one city or three times the size of all the cities?

A rather bold statement is made that given the contemporary English industrial structure, 30,000 - 50,000 people can give such a diversity. An efficient municipal size is essentially limited to a town without expensive internal transportation. The walking radius is all-important, therefore, and is stated to limit the town size to a one mile radius. The maximum density that can be expected is twenty-five families per city-wide acre (a one mile radius city has about 2,000 acres). Lower densities would lower the total population.

A proposal to the New Town Council (1919) edited by Hughes, makes fundamentally similar proposals, though this stresses social facilities more strongly and also tie between city and agriculture and land workers. A population of 10,000 - 20,000 is considered most desirable for a new town. Here, there is something of a better picture of the city itself. All public and educational buildings are to be at the center. A shop, a green, and nurseries are to be located in neighborhoods, though no further information is given on these units.

These two works are typical of what must have been quite a broad concern that the "homes for the brave" should be built in a viable and social fashion. They are written by planners but made at least partly for public consumption and are more polemic than helpful. The most noticeable ommissions are those of transportation and any but the most passing references to circulation. Critics of this type of development are right in pointing out the incomplete thinking concerning the place these towns will have with respect to London and other metropolises. Admittedly, were the writers to commit themselves, they would alienate themselves from one half of a probably evenly divided audience: those who sought complete

independence for the new towns and those claiming their survival was contingent on metropolitan ties of varying intensities.

What seems to be the most comprehensive analysis along this line is Purdom's, Building of Satellite Towns (1925); a revised edition (to which reference is made here) appeared in 1949). Purdom seeks to develop truly independent, self-contained satellite towns (if this is not self-contradictory). This hinges on the adequacy of industrial sites, especially so far as transportation and labor force adequacy go. This will determine size of city, but he is quick to admit that real economic base studies have not yet been done. He makes a "guesstimate" on the basis of performance of contemporary cities that those in the 30,000 - 100,000 population are in the optimum range.

Refering to Letchworth and Welwyn, he presents the case for more dense developments of residential areas. Letchworth has a density of 18.6 persons per residential area acre, Welwyn, 21.8. Purdom proposes 25, though part of this compactness reflects his decision to place all but smallest recreational areas in his ample greenbelts*.

The Poly-nucleated City

In this period, there are several proposals for poly-nucleated metropolises: A German writer, Gloeden (1923) is primarily interested in re-uniting work and residence and in overcoming the contemporary city's excessive distances while strengthening the social structure and taking

*In this connection it is interesting to note that the Reith Committee (1946) report on New Towns proposes a twelve person per acre figure.

advantage of metropolitan assets, the last a back-handed critique of those intending to devolve through establishing independent small towns.

To start with, he states that each worker and each child must be able to reach work and school by means of a fifteen minute walk. To achieve this, he proposes circular cells perhaps one and a half miles in diameter, approximately two miles center to center. The number of such cells depends on the size of the metropolis: each is to house 100,000 people. The cells are differentiated according to their economic function: some are wholesale centers, others cultural, etc. The center of the cell is for work, the homes of employees surround this, and the greenbelt between cells is dotted with institutions such as schools, recreation fields, and specialized activities as freight marshalling yards. Each cell is relatively self-sufficient - amusements, shops, etc. are sited, near the center, one gathers. Organically self-sufficient social and political communities are built up around the core which, so far as its economic place and function in the metropolis goes, is simply primus inter pares.

A simple spider web of streets provides circulation within the cell. The units are interconnected by high speed electric rapid transit lines and presumably by roadways. The pattern is not unlike that devised by Charles Lamb, only at a larger scale and with more ample green space between (though the English writers would not consider this park belt to be a true greenbelt - both on grounds of its narrow width and the absence of agricultural possibilities).

The proximity of the greenbelt permits higher than usual density. Gloeden has fixed the 1250 m radius - it depends on a man's speed in walking.

The 100,000 figure is not backed up beyond being held a "good balance" of health, cultural, government, service and aesthetic factors. (American and English writers would usually throw in a generality about employment base; Gloeden's failure to do so is quite significant as we shall see). The cell has some 1,000 acres. This gives over-all residential area density of more than one hundred people per acre. There is variety in density: on the edge, pensioners' cottages, increasingly crowded quarters until we come to the tall apartments near the center. This also is not further explained or defended outside of a vague aesthetic preference. He defends the resulting densities by comparing them favorably with contemporary German proposals (K. Siebold R. Eberstadt and H. de Fries).

The first and main criticism deals with the attempt to divide the metropolis into such cells. Possibly grounded in the European guild tradition it speaks of an extremely static society - one with which contemporary planners should certainly be at odds. So far as the individual worker is concerned, it may have some advantage, there may be benefits to the business concerns though probably decreasingly so, it may simplify a shopper's search for the right product, and it may help to establish a closely knit (but how parochial!) expertise, working, living, playing together. But, here, as throughout this thesis, we must note the political and social framework within which each proposal was written: and this was during Weimer. But now what happens from generation to generation: must each son (and the daughter) work in father's line? Even if he were to start out using the ever handy quick rapid transit, as Gloeden so cavalierly suggests, where would the son get the impulse to try another trade or field? This seems to be a system not only assuring unity but

also uniformity. Fortunately, with industry expanding both horizontally and vertically the establishment of homogeneous work cover as proposed herein is as unlikely as it is undesirable.

As in the several similar previous cases, we must note that a highway grid system such as this, is not proper for a road system. It has, however, many advantages for an underground railway system. Many questions must be raised, however, before such a system can be justified in a metropolis priding itself on its self-contained units.

Hugh Ferriss' Metropolis of Tomorrow (1929) contains elements of both the previous writers and specifically aims to incorporate developments in American civic design during the twenties, such as zoning and gargantuism. The very center of the city is open - and this is quite a novel approach. Frankly, from Ferriss' drawing it is hard to tell whether it is to be some form of park, one mad clover-leaf, or some combination of these. Surrounding this maelstrom is a ring of imposing buildings, on the scale of Rockefeller Center three groups, one each devoted to business, art, and science. Radially extending from these are shafts of areas devoted to the conduct of these activities with periodic vertical peaks. Lying between these are pie-shaped residential areas.

Weighing the distribution of a city's cubical content, he makes the rather interesting observation that a few tall buildings, surrounded by something of a low plateau, uniformly six floors high, is the most efficient. The virtue of the huge buildings lies in the implied simplification of vertical transportation.

The transportation pattern in the business, art and science areas (none is shown for the residential areas) consists of broad boulevards up

to 200 feet wide, with intersections at the base of skyscrapers. Parking is provided under the buildings. The road system thus becomes radial at the very greatest scale, a gridiron plan within each axis, and the major structures athwart the right of way.

His sins are mainly of omission. This is truly a paper city. There is no mention of industry or of productive capacity. If the implication is that the factories lie to the outskirts (perhaps as in The City of Tomorrow), then this, as that, becomes the reductionad absurdium of our civilization. To that may be added that the airport, together with unseen cables and the ether are the only links to the outside. Railways, long distance road traffic, etc. presumably are taken care of elsewhere. His aim is to distribute a city's bulk so as to have optimum health, safety, welfare and aesthetic oonditions. Yet one wonders if this applies to the mass of low lying buildings as well as to the towering giants. And one would wish to know more about the residential areas, which must be of truly gigantic proportions to support such a working space.

The Neighborhood

Perry's (1929) main social premise is that there is a direct relationship between the physical environment and the kind of life led by the inhabitants. Stating this so explicitly, he is only putting directly what is tacitly held by all the writers, Marxist, non-Marxist, and those ignorant of Marx. The chief physical premise is that certain functions belong in the center of the city, others at the center of a neighborhood unit, and still others at the periphery - and that the nature of the clientele determines these. The principal fact affecting the city is the ubiquity, the convenience and the

the threat of the automobile - "the neighborhood definition is being forced by the automobile", (p. 30).

The first step in his thinking is to establish which functions are strictly local. To conclude that these are elementary education, recreation at the scale of a small park and playgrounds, local shopping, and living. The neighborhood principles follow from these - we can do no better than to list them as Perry does (p. 35).

1. SIZE - Population for one elementary school: area depends on density.
2. BOUNDARIES - Arterial streets to facilitate quick passing by through traffic.
3. OPEN SPACES - These should be provided.
4. INSTITUTION SITES - Institutions having service spheres coinciding with limits of the unit should be grouped together and should be located centrally.
5. SHOPPING - Shops should be grouped on the circumference, preferably at the junctions so as to be close to other shops.
6. INTERNAL STREET SYSTEM - Streets are proportioned to the expected load, and should discourage through traffic.

Concerning size, he arrives at the one-fourth mile radius figure by citing recreation and school association publications and observations of distances young children willingly travel to attend playgrounds. A larger figure for shopping centers (one-half mile) is presented without too much support.

To arrive at the population figure for a neighborhood, he refers to a Regional Plan Study and an article by Strayer and Engelhardt, which suggest an economic school size at 900 - 2400 and 1000 - 1200 pupils

respectively. He concludes that the smallest economic school has 1,000 pupils. To compensate for the trend to Junior High Schools, he proposes use of a range of 800 - 1,900 pupils per elementary school. Then using 1920 census figures, he finds that one person in six was in the six to thirteen age group. The neighborhood population is therefore calculated to be 4,800 to 9,000.

To arrive at a density figure, he takes a lot size, 40 by 100, which he considers a good average for new neighborhoods. This falls within the population range for the neighborhood size already established, counting five people to the average dwelling unit. Allowance is made for recreation (ten per cent of the area). Information on the shop space required is obtained by taking the average number of establishments in a particular line per capita in seven arbitrarily chosen cities. This figure, then, is multiplied by the average store front length (found in another study). Shops are considered a blighting influence; one more reason for placing them as far away from the center as possible. With these non-residential areas subtracted from the total area, Perry still finds his density, area, and total population figures consistent; and therefore consideres them acceptable.

One further point is made. Perry stresses the need for community organization. He finds these do best in areas of 1,000 to 9,000 population: again this lies within the limits of his neighborhood unit.

In summary, his method is to consider several factors from independent source material having some empirical support for each, and, noting that these are not inconsistent, concludes that his formula is acceptable. Note that he is not, fundamentally an innovator: he takes some of the better

current practices and proves to his satisfaction that they are mutually compatible. His normative suggestions really boil down to a plea to keep fast through traffic out of neighborhoods, using this as a boundary, and to place certain facilities more strategically, more in keeping with their service areas.

It is hard, however to see what is the logical necessity to have only one school in a neighborhood. This is given simply ex cathedra. A totally acceptable scheme could be developed with two paralles schools; in point of fact, many areas are served by a secular and one or more religious schools. Are these any the less neighborhoods? A school-oriented neighborhood for all age groups is no longer so obvious, given today's new communication systems. However, if one were interested in building up group and family solidarity the school remains as the best site for such an effort.*

But Perry's importance stands in having popularized the unit formula and in being the first realistic opponent of the automobile, the first planner in whom practical opposition to the monster more than balances awe.

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*Refinements should be made in the procedure of getting the total population from the school-age population. First, simply taking census data from long past census does not take into account the very changes for which he is planning (the rapid growth of metropolitan suburbs). Secondly, taking United States aggregate age-distribution fails to take note of the considerable urban-rural differential. Thirdly, today the minimum school size figures would be challenged. While this does not in any manner shake the foundation of his study or conclusion, it does suggest that the optimum neighborhood size figures should be taken with a grain of salt. The same must be said with greater emphasis for the shopping center size study.

PART III - THE 'THIRTIES

The next group of writers bringsuss up to World War II. Depression years, yet there is relatively little talk of depression among these writers. There is generally a continuation of the pattern set in the twenties.

Massed City

The first examplesof a metropolitan plan from this period in many ways is a combination - one might almost say, an elaboration, of Perry's and Le Corbusier's. A proponent of the steady flow system, Malcher (1931) is interested in building a concentrated but congestion-less city.

The city is perhaps three miles square (in the absence of a scale, it is hard to be exact). It is another example of poli-nucleated activity points. In the middle is the civic quarter, perhaps a mile away in each quadrant lie two industrial centers and two business areas. The rest of the city is devoted to residences, decreasing in density with distance from the center. This proposal differs from other similar ones (viz, Gloeden's) in that the activity centers are not separated from each other by green areas but are really points of articulation in a continuous urban mass.

The highway system is really the piece de resistance. A hierarchical net of superhighways to culs-de-sac: each street reflects its place in the city. The highways provide the bounds to residential and other areas. Intertwined we find the pedestrian walk system with underpasses and crossovers to prevent the two streams from mixing. The way the

residences are distributed, one cannot help but feel that they are subsidiary to the highway system. One-family-homes are grouped (i.e., with respect to the road system) in primary clusters of perhaps ten, these are bound together by pavements so that perhaps 100 to 400 families constitute what could be called a neighborhood. No data is available as to how many people live in the center of the ciry or for that matter, in the entire metropolis.

This proposal, which is about as sterile and as primitive as any that has graced a major publication, can not even satisfy its base premise - to improve circulation - without fantastic cost. True - placing cloverleafs where conflicting traffic streams meet "solves" the problem at one level, but does not prove that the intersection, never mind the traffic streams themselves, though as presented here, is not thought out much. The plan has the texture of a wicker chair - true the strands don't meet, but one is led to ask whether all the over-and-under weaves are necessary, whether the endless pedestrian walkways into every recess of the city are justified.

But any such plan as this is, with its forbidding modern counterpart of the city-wall, suffers just as did the picture book cities of Medieval days. There is no provision for expansion, either in the internal sections or for the city as a whole. Admittedly this is but a scheme, but with no shifting of internal proportions could provision for growth be made. The further shortcomings of this plan are numerous - to mention but one or two: placing industry among residential areas with but a class 2A highway between home and workshop of towering proportion, the very dense nature of the development, the unjustified splitting of two business areas and the civic area itself.

Thomas Adams (1934) has developed a much more human city. The structure of his book suggests that he is interested largely in the problem of growth. He disposes of the linear approach (an unimaginative and uneconomic line of least resistance, even in its more sophisticated versions), the general and continuous spread (physical continuity and real nearness are not the same) and building of satellites (which only places the real country further away). His proposal is, however, a modification of the first, with what he considers is an efficient circulation system.

The author develops neighborhood units which are placed within the metropolitan road framework, a modified "spider-web" around a civic and business center. The industrial and transportation facilities occupy a relatively large sector, tangent to the business center but separated from all other areas of the city by a green strip. It is interesting to note that this actually does not differ fundamentally from a linear city of the more sophisticated kind (Stalingrad-type), and suggests that the use of some of the techniques of topology might clear up certain phantom arguments.

The neighborhoods are interpenetrated by green strips, connecting parks, and institutions such as schools. Parkways are "encased" in green rights of way linked to these. An abundance, excessive by today's standards - of local shopping centers dots the neighborhoods. Fifty percent of the residential area is in open space: twenty-five per cent for streets and commercial open areas, ten percent is devoted to the highways, while fifteen per cent is given to parks and playgrounds.

Residences take up 42.5 % and civic and business functions and miscellaneous the remaining 7.5 %. Population is stated to depend on pupils of one school. While density is not elaborately discussed, it is plain that Adams has in mind the generally open suburban development giving a residential area density of eight to twelve families per acre. With an average size of 160 to 200 acres this gives a neighborhood population of 1300 to 2400 dwelling units.

This seems to be an essentially sound proposal - certainly in comparison with some of the preceding works. The freely drawn linkages of green dependent on topography are still considered - and with justice - a laudable goal for planning residential areas. And yet the metropolis as a whole could stand opening up. There is suggestion of high intensity and low intensity direction as function of proximity to major radials. It would, perhaps, be a less massive glob if the agricultural areas were brought still further in - in short if wedges rather than just dents were provided.

In yet another way is this a tight proposal - though no more so than any largely ring proposal. Civic Center is hemmed in by the business area, business area is limited by the major highway and the residential zone. It seems that, planning at this scale, the often misused and abused term, "flexible planning", would have real meaning. No planner could or would state beforehand the area needed by a city function. He could afford to commit himself even less if he is, in other parts of the city such as residential and industrial, planning for unspecified growth. This points up the dichotomy of a ring system especially one where the interior is an area of high activity. In brief, a constrained center and unlimited

growth in outer areas are mutually incompatible. This is yet one more argument for opening up the city if growth is anticipated.

Two relatively minor criticisms can be leveled against Adams' neighborhood schems. There is little differentiation of housing type. It seems that again we come to the point of excessive evenness of a large mass. This could and should be relieved by varying housing types. Shopping is the remaining point. We have refered to the superabundance of local business areas. To this we add that their siting athwart intersections would no longer be accepted today. But in this, Adams was certainly no more conservative or revolutionary than his contemporaries. As a final comment one might remark that his solucion resembles in many ways the student projects which surround us today.

Adam's work is concerned specifically with the residential part of the city - he does no more than spot the business area. In that he is not alone - few authors give anything but the vaguest indication of traffic patterns or land use distribution in central areas. Norman Bel Geddes (1937) vignette of the heart of the city is one of the more exact pictures. The city of the future will be larger - he envisages further concentration with the tower building reigning supreme. Residences of all kinds are rigorously excluded from downtown areas. The gridiron reigns supreme, though at what looks like a larger scale than today's. There are three levels of circulation. The main motorways are sandwiched between sidewalks one level above and the parking and loading levels are underneath.

It is almost unfair to subject this to too strict a critique. It was supposedly completed within a month, was mainly designed as a photo-

graphic model, and financed by oil interests. There is really no supporting evidence for the statement that cities would be larger - though a plan drawn with the auto in mind could certainly find some data to back up an opposing conclusion. This plan is quite dependent on the low ground coverage of its tall buildings - and it is interesting to note the almost off-handed reference to municipal land ownership. Socialization of the land (it does seem somewhat peculiar in today's perspective - especially in the context of Bel Geddes' plan) here is something of a short-cut - as if the author were saying "latching onto this relieves me of the responsibility to go further into the problem of land and its distribution". This kind of criticism can also be leveled against the fundamentally simple, and frankly unacceptable decision to pile three circulation networks one on top of another and so "solve" the traffic problem.

Presumable a guide to modern city planners, the"Chart of Athens" (1933), and its exposition by J. L. Sert in Can Our Cities Survive (1942) is something of a let-down so far as contributing much along the lines of this thesis.

There is repeated reference to the need for integration of town and country - the region. But it is not clear whether this means that the outskirts of a city should blend into suburbs or whether this is a statement stressing the importance of city to country and vice versa.

No reference is made to any one type of internal organization as compared to another, although it is clear that some sort of neighborhood structure is envisaged with communal facilities in the center, commercial ones on the boundary roads. Decentralization is opposed, especially

industrial. The optimum allocation of activity would seem to be one with peaks of relatively high intensity separated by narrow green bands. This applies specifically to industry. A somewhat equivocal recommendation is made: work-residence distances should be minimized, but industrial areas should be placed "independent of residential districts (indeed of other districts as well) and [these should be isolated] by means of green bands or neutral zones". However, small, non-noxious factories can be integrated into residential areas.

While geographic variations will exist, the minimum population which can be considered desirable is 50,000. Sutdies of local CIAM groups are cited in this connection; studies which tried to provide for "various functions of the modern civic structure".

Considerable criticism is made of the excessive densities of today's city center. However, thr proposals reflect no opposition to heavy density if controlled and well planned. Toward the center of the city there is high density in the form of free standing apartments, since low density cannot be justified here. It would be antithetical to community life, there are land cost problems and high density shortens distances and makes service provisions more economical. Farther out we come to the low density areas, but Sert comes out against medium density areas as being neither fish nor fowl. It is not hard to see the influence of Le Corbusier in this proposal in all but scale.

The approach to city size is quite laudable - but still not one which is completely acceptable. Economy in the support of social facilities may first of all fall in different population sizes for different facilities and different types of populations. More important, this data in turn may

show different optimum sizes when reflecting variations in the labor or industrial base or variations in the basic size of social groupings. In short, can economy of public services be the crucial variable. Of course, this criticism applies to many other works we have considered.

The discussion of density is quite straightforward, but not entirely objective. The argument for sharp contrast fails to take into account that people do not necessarily fall into diphotomous categories: we are all familiar with the types who need relatively high density homes in suburban areas (the pensionist relatives of young families) and vice versa. There are also problems of preference and economics,, not simply those of sky-line aesthetics, in this. And variety can be far more pleasing at a small scale - it is also essential.

The next proposal on metropolitan scale is Frank Lloyd Wright's (1940) Broadacre City. An automotive Jeffersonian, Wright, as much an aristocratic democrat, proposes as did Jefferson, a grant of land to everybody,, and so provide the basis for the good society and for democracy. But ownership must be universal - and with the automobile, this now becomes plausible and culturally possible.

Concretely, the proposal provides a hierarchical net of superhighways to country lanes, with private and social activities deployed along the roadways with regard to expected traffic generation. No one focus exists; it is assumed that a vehicle's speed makes a much larger range of sites accessible, and yet permits an actually greater centralization of markets, entertainment and schools. Here, on a different scale, is the germ of the poly-nucleated city of the auto age.

The circulation net is established by a one-half mile superhighway grid, with a rectangular system within the net. Some rather remarkable intersections and bridges are provided.

In the presumably sample section presented, there is a population of 1,400 families, with employment for an indeterminate number: presumably these would be commuting. These 1,400 houses range in size from the one acre home of a childless couple upward, but the average density comes to roughly one house per two acres, gross. Perhaps one quarter of the area is devoted to non-residential uses. On a nationwide scale, this means that perhaps 100,000 square miles could hold a reconstituted United States population or pretty close to the area of California. It represents a concentration only twenty times as great as the nationwide density.

The main question of course, is the desirability of such a life for all people. It frankly requires too much effort on the part of some people, and is too often for what must be the social requirements of others. It is a design manifestation of rugged individualism, but far too strict and didactic.

"The city of master less men has found a Master! You'd say it was they were the conquerors; they that had conquered" (MacLeish). The car is such a "master" here. In overcoming time and distance in this fashion, the city has fallen yet more subject to it. Imagine the total isolation, the collapse with an unexpected shortage of gas, or the huge investment rendered useless by another technological advance - for example, the helicopter. Any design which so puts its eggs in one basket has serious drawbacks.

But let us go along with the assumption. The 160,000 square miles of settled land of a Broadacre-ized U.S.A. would be served by 640,000 to

960,000 miles of superhighways (depending on how the units are related) - more if the cities are scattered and require (presumably arterial) linkages. It is a pity that Wright does not explain how the sections are related, or if the sample is really representative as he implies, how low or high a density would remain consistent with his proposals - what in short, is the range. But assuming that the texture does not vay much, and that not more than 100,000 miles of superhighways are needed to bind the units, we find that Broadacre city cells for a total of three-fourths to one million miles of arterial highways, and a total road system of several times that length. The present mileage of all roads and streets in the United States is in the same range. Put in another way, let us assume that the average family will own two cars in Wright's city. Then, one hundred cars are 'assigned" to each mile of superhighway, or fifty families in a way are responsible for one mile, of for $10,000 each for a million dollar per mile artery. Further, this calls for a national expenditure for superhighways of $1,000 billion. And highways are but one of the linear factors which are stretched excessively. While many homes presumably will have their own sewage disposal units, the other utilities and especially local streets will add a great burden to home ownership. A less rigid design decreasing the linear factors but keeping the same area relationships should be developed.

Neutra (1934) seems to have developed plans and drawings for a total metropolis, but the available published material (see also Boesinger, (1951) stresses the residential and industrial parts of the city. A residential zone is perhaps 3500 m by 10,000 m, or some 8600 acres. It is bounded by major arteries, and the uses are so arranged that the unit can be repeated and extended in all directions in response to population pressures.

Two social fundamentals affect design, and reflect the declining desirability of separating different types of families. So far as work places are concerned, Neutra attempts to minimize commuting and so deploy industry and commerce as to permit residential area's growth instead of blocking them.

A residential zone, then, is composed of four units, each with one type of house. The area allotted to each type depends on Neutra's calculation of the number of aamilies which can be expected to live here, with United States census data on family size as the source. Neutra specifically states that as changes in family sizes, structure, and incomes occur, the area proportionswill change (through presumably not their relative position).

Industry and shopping are located along the railroad and the main arteries respectively. The highways and their surrounding plantings act as buffers between these undesirable uses and living sections*. Business faces one side of the major artery in the long narrow blocks. Pedestrians circulate on a raised walkway with traffic on the lower level. Internally, the residential areas are served by a formal gridiron street.

2, 229,000 people, together with the indistrial and buffer areas make a unit. The over-all density comes out to be twenty-five people per acre. But the significant figures, the ones with which Neutra started, are those for each housing type. Apartments for single people, set in the greenbelt, at 480 people per hectare (195 per acre), patio dwellings at 57.2 per hectare (23 per acre), two story courts for young families at 112.5 per hectare (48 per acre), and free standing homes at 35.1 per hectare or (14 per acre).

The scheme's raison d'etre is also its most vulnerable point. And, in the material that is available, Neutra fails to defend or even give his reasons for separating different family size. To mention just two shortcomings of such a system: the individual family lacks any feeling of permanence and is uprooted at least three times in its lifetime. Then, too we tend to look down upon such ghettos as are here proposed. Contacts are limited, and while certain communal facilities are more economically supplied, others would suffer, for example from the absence of mature leadership from within the immediate community.

The same criticism that was made of Perry in his use of Census data must be made with regard to Neutra. But here, in addition, there is envisaged a basic change in the way of life. How reasonable is it to refer back to the unreconstructed society for such important data?

The complete separation of functions leads to the same type of excessive dependence on the automobile as does Wright's scheme, perhaps more so. Residents of the middle zone (young families in apartments) face at least a two mile treck to work; a longer one if they are employed outside the unit. While children spend most of their waking hours in the school compound area, they too have to be transported long distances. This however, is quite consistent with Neutra's views and seems to be finding acceptance by certain school systems (New Orleans, for example).

Dispersal Proposals

As in the previous periods, some people continued to think in terms of the rurally-set town. In England, one branch of the veteran's movement formed the "Hundred New Towns Association". Trystam Edwards (1933), writing

under a pseudonymn, drew up the proposed sample town for this group. It is important to note that they were planning for a society within the framework of existing institutions. No revolutionaries they - only to build a fitting "war memorial".

The new town is to sit in the country and is satellite to none. Opposition to commuting is based on its high cost - prohibitive to most workers. Furthermore, they must be sufficiently far on the land to provide attractive homes for agricultural workers and so halt their city-ward flight. The town has an industrial base however. But the electric grid, it is suggested, makes each site equally attractive for industry and therefore permits the towns to be scattered throughout the island and especially in declining areas. In order to conserve land, make internal circulation more efficient and for "aesthetic reasons", a compact form is urged for the city.

The scheme shown is circular, though adaptions to expected sites are also shown. In no case does the city exceed two miles in the longest direction - they are close to four square miles. The city has a sectoral division of major land uses - the non-schematic examples approach this as much as is possible. The different uses - residential, recreational, commercial, etc. - seem to be placed in a relatively random fashion, at least no explanation is given for placing the uses or the reason for variation between the different diagrams. About one third of the area is devoted to residential uses, one sixth each to commercial, shopping, industrial and major recreational purposes, with a civic core.

Not too much attention is given to the transportation net. What appear to be major streets divide the different land uses; a spider web

system was employed in the major scheme, other systems in the other examples. Shopping is to be off the rail and road routes to prevent congestion.

A 50,000 population is suggested as being neither too small nor too large. This is supposedly adequate to provide educational, social, and cultural facilities. A town-wide density of 12,500 people per square mile can be deduced from the fact that there 50,000 people occupy a town of four square miles. This comes to about twenty people of five or six families per acre. If, as is suggested, one third is devoted to residences, the density here will be on the order of eighteen families per acre.

This essay into town planning by an architect leaves much to be desired, but seems to have had an important place in contributing to continuing interest in town reform. Acute in some respects (as in opposing the traditional interwar building of "mean" suburban streets), its failure to grasp important planning principles can only be justified by its wish to communicate on as few issues as possible - but with great strength there.

One wonders if a city of this type could justify a commercial and shopping zone one-third the size of the whole town. The relation of the uses one to another leave much to be desired. For example, shopping is as far as possible from residential areas, while industry borders one of the living zones. Let it be said that at this stage, Edwards, beyond wanting to bring the size of towns down to walking distance scale, did not consider relationships of the internal areas. The same can be said of his non-schematic example, which compounds the situation by building in an "across the tracks".

A planner in search of information and principles regarding optimum population intensities just won't find them here. This work is really, in spite of its form, not a planning proposal but a well written social tract.

A decade later, Edwards (1944) writes again and he obviously has cleared up some of the vagueness in his mind. He is more emphatic of the place of new towns in the national economy. These new towns will absorb not only excess Londoners and residents of other metropolises but also, over the years, much of the overspill which has so desecrated the English countryside. These new towns must be independent and not mere satellites- advances in technology have made that possible. A satellite city serves to emphasize the metropolitan nature of English population distribution, which leaves some areas underpopulated and others too full. It is his contention that the small, independent town, can become the locus of all sorts of personal, group, and civic virtues now virtually absent from the British scene. He specifically opposes the garden city movement on two grounds: that it started people thinking in terms of open development which resulted in the urban sprawl, and that it made people far too conscious of the amount of land they owned. He was a proponent, as most of the writers were, of municipal or at least wholesale land ownership. This takes form in proposals for continuous street façades - essentially row or terrace houses not unlike those proposed by Sharp (1940).

Internally, the city is still divided into sectors, but these have now been narrowed and we see the first absolutely clear introduction of the idea of green wedges which bring the country to the heart of the city. This accounts for about one-third of the town area. In each of the zones

Edwards proposed that miscellaneous buildings be placed to prevent differentiation into too rigid sections.

While he now states there is no one optimum size for a town, he still holds by his choice of 50,000 as being adequate for purposes of explaining his scheme and that it is satisfactory, neither too small nor too large.

His choice of form is consistent with his view of a flexible population. A wedge scheme is unlike a greenbelt or circular system which cannot, except through change of density or of the land use pattern, permit growth. Each of the three residential zones proposed has 14,000 people at twenty-five per acre. 8,000 people live in the center in more concentrated buildings. He continues to argue for relatively dense urban settlement, up to forty people per net acre in row houses with large public gardens nearby.

While this shows that Architect Edwards has come closer to planning considerations, we still find some curious anomalies. His choice of wedges to be next to each other shows that he considers them more interchangable than they really are.

So far as his arguments against garden cities go, we have to discount his comments beyond the general criticism of all proposals which tend to emphasize excessive urban movement. But even here, we have to ask Edwards if he really believes that his relatively isolated new towns could provide all the facilities that the largest cities could.

Edwards is not alone in being so impressed by recent technological advances in power distribution and transportation. Yet from the research in location economics, we know how marginal, even with the technological

E R R A T U M

Footnote to be inserted page 51.

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*The findings of the Urbanism Committee of the N.R.C. (Comey(1939)), referring to the U.S.A., established that those planned communities situated close to cities have been the most successful.

advances made, freight factors can be. Distance not only from raw materials but also from markets will continue to affect the health of towns. This tendency to think in terms of one point economics, or in terms of equality of location, has led to much confusion in planning, from Howard's day to this*.

Clarence Stein (1951) was very active throughout this period. His ideas, though only recently gathered together in one book, represents a period of activity spanning the entire interwar years. Though one can say that none of the principles are truly his own except the dual fronted house, their integration, their actually being carried out and examined critically, give Stein an almost Olympic character in the field. We can discuss his thinking in two stages: Radburn and Greenbelt.

Radburn, a town for "living with the auto". The first principle is the superblock. This incorporates several sub-points. One is that today's town has excessive street area, another is that a block should have more than simply residential uses (at least open space), and that homes can be distributed with higher regard for amenity. The corollaries follow (or, in Stein's thinking, was the process reversed?). Specialized roads would be built for one use only: the distinction between movement collection, parking, and visiting. Pedestrian and vehicular traffic with their separate requirments, should be handled individually. Consequently, houses have "dual fronts", and the backbone of the superblock, the pedestrian walkway system, is extended to a park, the segments of which should be limited throughout the development. Stein accepted Perry's neighborhood scheme as the building block of his city. This is the only form considera-

tion that is presented. Surrounding greenbelts were considered, but effort was concentrated on what Stein felt was the more important interior green area.

The only questionable item here is the cul de sac system with its two faced houses. Lack of privacy resulted. Heavy planting or some modification of internal architecture could improve this.

Greenbelt - is a synthesis ot the Garden city, Radburn and the neighborhood ideas with the unfortunate ommission of industry. Combining the best features of these, all that need be said is that this is certainly one of the most magnificient examples of planning and application of planning principle. One example only: By choice of a crescent form, there was achieved physical centrality to the shopping, school and recreation area while growth of all elements was permitted (not that growth of residential areas should have gone as far as it did)*. Yet it also can be seen as an example of sector theory. It is an instance of a happy combination of the best of both approaches.

So far most of the examples considered have come from democratic societies. The final scheme in this group from the interwar period is for an ideal industrial community designed in Nazi Germany by Kohler (1939) to house the employee (and their families as well as service and other workers) of an armaments factory set in the midst of a forest. Is totalitarian design in planning different from its democratic counterpart?

The town has one focus - while elliptic is essentially an example of the circular city. The street pattern focuses (and was meant to do so) on the strongly articulated civic center which almost splits the town in

two. There is no neighborhood structure: the focus is on the center. The main through road and railway are conveniently apart to hold the town between them, with the works to the south. This means that road traffic to the factory will pass through the town. Two kilometers to the south is the industrial area - so placed on grounds of air raid protection.

Population is fixed by the demands of the factory: 5,000 workers a town for 22,000 people. This leads to an overall population density of 95 people per acre gross. Flats above shops in the main streets, rows and one-family houses elsewhere.

The main thing that should be considered here is whether from this one example, we can see "totalitarian" planning. So much writing is replete with democratic phraseology that one is led to conclude that ideology has its physical counterparts. And yet, looking at this plan, one wonders. Here are the same curving streets, the same interpenetration of parkways from the greenbelt, the civic center (though devoted to demonic works) occupies no less an imposing site than each of the previous schemes. True, factory workers tramp some distance, yet no more so than the Brazilians under Wiener or French under Garnier's or Le Corbusier's plans. It would seem, in short, that the city plan at the scale considered here, is essentially a neutral vehicle. Proposals for a new social world - these do have the stamp of authority on them. But when the planner is essentially conservative, or designing in the interest of the welfare (real or imagined) of the inhabitant (and this can, true, be only to raise production for a war machine), the drawn plan fails to disclose the intention of the author.

Linear Proposals

During this period, the linear proposals become real city plans. This development took place in the USSR, and seems to have been largely the creation of Miljutin (1932). As a Soviet writer, his main thesis is that location problems could be solved on a purely "rational" basis since land was nationalized. By this he seems to mean that reliance should be placed largely on considerations of site, orientation, etc., and on the location of raw materials and the transport web. Present location of markets and of labor force is an omission which struck this reader as quite significant. The town's main purpose is to help expand productivity.

Certain factors serve to force the optimum population upwards - but these must be kept under control since Soviet society should recognize the undesirability of perpetuating the urban rural split which gargantuism aggravates. A population size between 100,000 and 200,000 is recommended. The factors working for a large new city population were the increasing size of factories, the fact that it was found more costly to transfer people to four or five small new towns than to one large one, that one large labor market was advisable to several lesser ones, that facilities could be more economically provided (they covered a far greater range, of course, than those for an American counterpart), and that in the short run, a large city was socially better, for it fostered a higher degree of class consciousness, solidarity, etc. But, these factors suggesting a large metropolis must be kept under control, for under Communism, the city as a largely industrial and exchange phenomen would be an anachronism, an instance of misapplied capital investment which would have to be torn down.

The ribbon city was developed by Miljutin and associates (Ochitowitsch and Gunsburg) to give physical form to these socialist ideals. The proponents carried the Spanish linear example one step further by providing a cardinal place for industry: there was to be close and physically continuous integration of work, transport, and residence. But dwellings were to be separated from industry by at least 500 meters of open land, a distance both large enough to provide a green and nuisanceless setting for the homes and yet permit a walk to work. The industry as well as the station was placed between the railway and the greenbelt - high road. Agriculture, the other working zone, is placed behind the houses, so that workers and peasants can live together, so that the drainage from the homes can fertilize the fields, and that the agricultural products need not be carted over long distances to reach their consumers. Technical schools were to be located near agriculture and industry to foster the education of future workers and farmers, and elementary schools (significantly) in youth villages close to the industrial areas. Other institutions, depending on their need, were placed either outside the town or in the industrial area. Warehouses and utilities, building yards, etc., were planned in the industry zone. Any departure from the order of zones is strongly opposed.

This differs from the early linear city proposals in that it is an urban environment, that the highway (and rail route) do not run in the center of the development, and that as we mentioned above, definite provision is made for industry. It is not the largely commuting villa suburb as the Madrid example largely was - neither is the Russian proposal the segmented inter-metropolitan band such as we find proposed by ASCORAL - Le Corbusier (1945). The 1930 development of and post World War II reconstruction plan

for Stalingrad show a linear design - but interspersed with green wedges perhaps one-half kilometer wide. This is a mid-point between the Miljutin and ASCORAL Schemes (q.v.).

The Soviet linear city was abandoned as an ideal during the early thirties - largely, according to Parkins((1953) p. 28) for the very difficulty we noted earlier regarding the general linear scheme: it is uneconomical so far as public utility and internal communications are concerned.

One difficulty which this design encounters is in providing a non-linear center. The Magnitogorsk plan envisages a "downtown", and immediately a confused picture emerges (though aggravated by consideration of topography). This is as much a sector city, somewhat tortuously made to conform to a linear pattern.

Soviet planners have throughout tried to limit city size. From Moscow on down, one of their largest problems has been to stop excessive city growth. It is paradoxical then, that a Soviet planner should have chosen the urban form most suited to unlimited expansion (granted that there other good theoretical reasons for his choice). Finally, there is the rigidity of the formula - "there must be no departure from the sequence of these six zone groups. (Miljutin(1932)p. 29). Even in the plans we note departure from the scheme: agriculture is missing, for example (this might reflect a frequent topographic contradiction: a riverside residential location is desirable, but prohibits the agricultural - residential bond so desired). It might well have been this rigidity as well as economic problems which led to the official opposition to this design before its acceptance.

PART IV - WORLD WAR II AND POST-WAR

We now turn to the works of the post-war era, the contemporary th theories. Fifty years have passed since Fritsch's work, and several of the authors are in a contemplative mood. Welwyn stands, Greenbelt is built, examples of municipal plans - yes, even of deeds - abound. The works in this period tend to aim at a more general applicability. While we read of the ideal town, the example is as much a vehicle for a complex of accumulated ideas on town planning as a suggestion for one city. So let us tread carefully.

The Massed City

The master plan for Warsaw (1949) by the Polish Ministry of Reconstruction (1946) is the result of applying certain general principles which deserve attention. A city is the center of its region; therefore its plan must recognize that transportation and exchange are the main functions. The city should thus be developed in cruciform fashion. Given modern technology and modes of transport, dispersal along the main axes becomes feasible; thus, the better environment is made available to a larger proportion of the population.

Dispersal does not mean decreasing intensity alone. It also includes the concept of even larger green areas which separate the concentrations. On an over-all basis, this means that the city is 25% built-up, 75% of the area is devoted to the intertwining spaces.

A decentralized city, to serve its residents, must have a "hierarchial pattern of territorial units". The size of these reflects the facilities which are provided. The housing estate for 2000 residents, the neighborhood

for 10,000 people and the district for some 50,000 inhabitants all have their corresponding series of social, educational and health facilities. Economy of unit operation seems to be the criterion by which these sizes were determined. Since reduction of the journey to work is one of the major goals, some employment opportunities are provided in the area. In addition, heavy or noxious industry is located in two areas on the major transport routes. But on the whole, each unit and sub-unit must be a cross-section of the region: all functions should be represented on every level with emphasis, naturally, on the dominant function.

This last is certainly a controversial assertion although it probably is more so in theory than in practice. There is really only one basic question which this plan poses. Granted that the city is the focus of the region. But is it wise so to concentrate traffic and the traffic generating activities at the heart of the city? Some bypass system at least would alleviate the pressures which are sure to arise.

Justement's work though largely an argument for progressive replacement of all existing urban structures, and although mainly concerned with Washington, D. C., has several points to make within the scope of this thesis. He sees no reason to depart from an essentially concentric form - the center, the peak of activity, with rings of decreasing intensity surrounding it. Between the civic-shopping-commercial core and the beginning of high-density residential area, there is a relatively wide greenbelt. this is placed here to absorb expansions and contractions of the admittedly constrained center. It also provides the space for adequate ring highways without which the city, and <u>especially</u> its heart, could not survive.

The unique feature of this proposal is to provide space for the economic base of the city - government offices and institutions in Washington's case - in a ring surrounded by residential areas. This highway based development would, in the example given, provide 26 linear miles of optimum sites (at radius four miles) and jobs for 700,000 people. The point, of course, is to provide a vast working area reached without unpleasant or time consuming travel through dense central areas. The number of people who could walk to work would be increased many fold. And there is the underlying assumption that modern communication systems obviate the necessity for physical proximity of structures. Easy mutual inter-accessibility on a highway is sufficient and often in terms of time, as efficient even for movement of people.

With such a strong circular articulation, it is not surprising that this plan calls for a radial-circumferential highway system. The 'work' ring is located in a zone of medium density - 35 people per residential area. Zones range from 100 to 10 people per residential district area. Its exact location in any one plan would seem to depend on the outcome of weighing the desired length against the need not to place it too close inward (lest it be self-defeating) or too far outward (in which case not enough people would live within convenient distance). Within the large circulation framework, there is to be considerable flexibility in neighborhood design. A change from high rise through to free-standing homes characterizes the passage from the high density in town to the semi rural outer areas.

Justement does not deal with what is nearly an underlying issue (he did consider Washington only, after all). Could this circular deployment of the economic base work for another type of city? Note that

industry has no place in his plan. Could this system work for a Philadelphia? The separating greenbelts would then begin to assume areal rather than linear characteristics at any scale and might prove to be quite constraining barriers. For industry which has to be served by a rail line and other expensive linear factors, this would not prove to be an economical distribution of its sites for the same reasons that a linear city would not be.

One wonders why, on broad planning principles, Justement so clearly holds by the conservative ring theory. Except for the Potomac , we miss the intrusion of large scale green areas to the city. The ring would not suffer by passing through such wedges - certain institutions such as hospitals would benefit by it. There is a related problem: is it wise to restrict the band in which the employment ring is located to a relatively uniform 35 people per acre? Would not one expect concentration bandwise or at least in strategic points along the ring giving the scheme more of a sector basis?

Sanders and Rabuck (1946) present a plan whose main characteristic is the intrusion of green areas almost into the core of the city. The developed areas show a compactness coupled with low building coverage, this in order to promote efficiency, economy, and urbanity consistent with no overcrowding and a healthful life. The built-up areas show a checkerboard of neighborhoods. Points of high intensity development occur in the middle of the outlying tongues and of course, at the center of the city. Small concentration of light industry are scattered along the edge of residential areas. Heavy industry is placed in certain of the wedges (as are the airports) and in the greenbelt. In the latter case industry seems to be placed

very consciously as a stopper to possible expansion tendency on the residential areas' part. The wedges are for intensive agricultural use, water storage, the specifically located industry, airports, various recreation uses, and as routes for interregional highways and railroads.

At the largest scale, the plan shows a circular ring with radial circulation system. Twelve major radial highways and important circumferential arteries every one or one-and-a-half miles bind the city together and tie it to its region. The railway line is the outermost circular route; several radial lines bring the trains through the green wedges to the heart of the city. Within the built-up areas, a grid of major roads, perhaps one-half mile apart, separates the units. Internally, the neighborhoods are served by a rather free pattern of roads. Interspersed among the residences, the freely drawn green and park areas link the various sub-sections.

No information is given on total size, though the metropolis as drawn suggests a population in the two million range. On a neighborhood level they see a population range from 3,000 to 10,000 people. This is deduced from figures presented by a school authority (Engelhardt, Jr.): 400-800 children per school. Sanders and Rabuck acknowledge that if more than one school is provided, there is no reason not to exceed the higher figure. A half-mile walding distance to school establishes the physical size of the neighborhood. Residential densities vary both between cities and within a metropolis. For New York, high density areas can house sixty families per acre. In smaller cities, the maximum would be one-half that. The densities decrease from the points of concentration near business areas. Sanders and Rabuck are impressed by Univin's argument, and by other low density sources.

The failure to commit themselves on the question of total size is paradoxical in view of the form of the city. The planner would have to make very definite decisions early in the growth or planning of the city: for example, where to place the important railway belt line, which the authors present as a definitely confining element. The same can be said about the location of the heavy industry plants. The location of these has definite implications on the total city size. Unfortunately no guide or principles are given.

Neighborhood size, too, is left somewhat up in the air. Sanders and Rabuck make the wise observation that given two or more schools, neighborhood size could vary. But they do not seem to have recognized that in so doing they have kicked out the only real support from underneath the neighborhood principle which limited the size of the unit*.

Their rendering of a neighborhood illustrates rather clearly a difficulty which is encountered in trying to relieve traffic in some areas while concentrating it in others. The roads bounding the neighborhoods, to carry the anticipated load, are four or six land divided arteries with infrequent crossings. They look like rather impenetrable barriers to day-to-day circulation. It is a major enterprise to cross from one neighborhood to another. While Sanders and Rabuck very correctly urge the maximum diversity of population types in each neighborhood unit, the areas

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*At sixty people per acre (the largest permitted density in their scheme, aand at a 3:5 ratio of net to gross density) an area within a 1/2-mile of a center could have some 18,000 residents, or a population sufficient for two or even more schools at one point. The authors could have suggested this contigency, but they are not so specific. The point remains well-taken, though rather devastating.

The Goodman brothers' approach is one of large-scale economics. They establish three basic economic conditions, each with characteristic planning problems and solutions. While they don't commit themselves explicitly, one might say their heart lies in the second approach.

First is the city of "efficient consumption": one planned for maximum production and use, a veritable Brave New World. The plan must minimize service and distribution employment through an efficient plant and a concentrated market, i.e. city. The country is nearby to permit full flight for the several million inhabitants. Rings relate to the place in the productive scheme.

The inner sections are circular, the other sections sector like. The premises lead the authors to propose as the central zone one building twenty floors high and one-half mile in radius. This represents a culmination of current building trends and is the logical transfer of functions which should be in a city's center. This edifice contains the market, light industry, offices, hotels, etc. It would be more efficient, in its use of heat, light, etc. Consequently, the number of people in non-manufacturing employment would be decreased. Social wealth would be created by the concentration of display and of convenience.

Zone two is a mile wide ring to include the university and other cultural facilities. The outermost two mile wide ring is residential with institutions tied to living areas. Some form of superblock arrangement, with internal communal facilities for the perhaps 4,000 residents is proposed. The residential area density is somewhere in the 400 people per acre range. Given the area devoted to residence, this would provide homes for some seven million people.

The sectors beyond this alternate between heavy industry and agriculture on one hand and forest preserves and "vacationland" on the other.

Not too much is known of the transportation system, it is obviously radial. But the omission of a circumferential system is hard to understand. What happens under the mile wide central building where these routes converge is also hard to imagine. A minor detail regarding the "university" ring. It is well over six square miles in area, which looks awfully large. One gets the impression that the authors placed it there as a transition zone between the terribly huge central building and the living zone, and not for any other real reason. To be consistent with their view of society, should not the major cultural and educational plants lie near the fountainhead - the industry - (and so get advantage of the nearby green area) - rather than be placed next to what is society's secondary function?

Again we must criticize a circular plan for its failure to allow growth. Again industry is the cork placed against residence, again the core cannot expand. This is the more serious in a city planned for efficient consumption. Cannot one argue that growth would be one result of such an "efficient" system?

Plan number II: the "New Commune". We have just described the plan for the maximum production - this is for a relaxed medium, with a four hour work day and consequently a more leisurly life. The society envisaged is a communal cooperative and anarcho-syndicalist one, and shows the balance of semi-autonomous groupings of dwellings, factories, farms, and social facilities.

The city lies at the intersection of two major highways, emphasizing the interdependence of the region's parts. Two foci exist. One is near the intersection. Here we find the airport and the regional shopping center. Abutting this is the high point of residential density. This is the area of "squares" - the clusters of different kinds of residences, interspersed with light industry, shops, recreational, higher educational, and cultural facilities. The focus, however, of each of these is a pedestrian "square". Presumably, the clusters vary in their population and their density. The total population for zones one, two and three is 300,000. In the next two zones, we find diversified agriculture: farms and schools for the children grow up with nature and are sent to the farm area. The outer two belts are also agriculture - industrialized and then open land grazing.

Unfortunately much is missing here. One gathers that the authors are displeased with the impact of the automobile on the metropolis and on our civilization. It would nevertheless be good to know whether and how vehicular access and circulation would be incorporated in the residential areas.

For writers so immersed in social architecture and planning, they are singularly silent on demographic questions. Self-contained units, yes. But how to go about determining their size or their composition?

Relationship to other areas is not really touched on. Is this in fact but a satellite dependent on other possibly more conventional centers (certain metropolitan functions are absent)? Or is the new citizen going to be satisfied with his siesta-like life?

Plan III is more an economic discussion than a physical design for city planners. The two examples of a"minimum" city for a subsistence

economy share little beyond placing work and home relatively close together. Efficiency and cheapness ("but cheapness in the long run") are the determinants. Housing and communal facilities must be of quality, given their important role in satisfying workers and leading to higher production.

Although the authors state specifically that these are largely schematic representations, one is left to wonder about their interrelation. A subsistence economy can and does move upward; a production-crazy society could work toward the more sophisticated or advanced commune society. Yet it seems that each is invested with such a large capital investment as to make transition from one to another very difficult. But as a very intelligent exposition of the results of current trends- perhaps stressing their incompatability - it makes its point.

To close off the study of metropolitan schemes, we come to two recent proposals. The first is by Norbert Wiener (1950) and his M.I.T. associates. His first aim is to find a decentralization scheme with facilities for evacuation and transportation bypasses, requirements set by the devastating threat of atomic warfare. The second requirement for the scheme is that it must provide for a livable and viable city. The criteria, then, are to reduce panic through knowledge that adequate services and facilities are distributed around the city, to permit motion in any direction, and to establish a transportation system which could continue functioning after attack.

The M.I.T. associates superimposed the improvements on what we gather is an existing metropolis. They claim that the program would be

useful in peace as well as in war. It would reduce congestion and stimulate orderly suburban growth. The first items are additional radial roads leading to a magnificent ring boulevard at a ten mile radius. Five miles beyond this we find a multi-track rail line, serving as bypass, metropolitan distributor and inter-line link. Hospitals, supply depots, warehouses, auxiliary power stations and communication centers line the highway, and tent cities are held in readiness in this area. The growth of supermarkets, suburbs, etc. is encouraged along the highway. However, all further building in the greenbelt (that is, the area between the present edge of the city and the ring highway) is to be prohibited.

There are many unanswered questions here - we shall only touch on those dealing with this thesis. We wish Wiener et al were more specific on the nature of the suburban development along the highway. We have seen how such a linear city (for it might be such) can take several contrasting forms. There is implied in any dispersal scheme (1) a maximum density and (2) a maximum total population in an area or on the highway with the same force or with a reduced intensity?

The picture drawn disappears in almost a mist as the center of the existing city is reached. It is a pity the communication crew does not impart its thinking on the downtown end of the dozen or so superhighways leaping inward. Several important consequences on city form and distribution of functions could have been deduced from alternative schemes.

There is an underlying assumption that the growth of the city shall continue. This in itself is debatable; at least it should have received more attention. But granting that this is so, there will be shifts in internal land use distribution. There are two alternative possibilities

sibilities (1) either there will be a continued or greater premium on in-town location with the result that commercial or other non residential uses will displace existing residence areas and thus provide the people to populate the expected new suburbs. This could result in more intensive internal uses. Or (2) there will be a more spontaneous movement outward of residential and non-residential uses or of residential or non-residential uses. This would result in something of a loosening up of in-town areas. At least two alternatives of relative concentration then would result and it is a pity that the proponents of the scheme do not write which they consider more likely. If the latter, there could arise the relatively unique and untried "doughnut" city, with but a secondary, vestigial center in the middle. This could also be seen as the final step of an efficient new town system where the core city is abandoned. Or, it also shows one interesting possibility to which the linear cities are tending.

Wilenski and Ferris (1954) were presumably thinking of a city in the St. Louis size range when they drew up their recent plan for a metropolis. Here is a more true doughnut shape. The center (for an undivulged reason)is a huge park. A thirty degree sector is devoted to business (the peninsula at the confluence of two large rivers) the rest of the circle is residential, a wide ring bounded by main circumferential highways and cut across by neighborhood-defining radials. Along the outer ring highways are the airport, the hospitals, the major suburban shopping center, etc. These are set in a greenbelt. Downriver from the city is an isolated industrial area.

This plan is too briefly presented to be thoroughly understood. The authors express the hope that growth can be controlled. This is rather hard to see - that is, how growth can be permitted at all, unless the institutional and other greenbelt-set functions lose their character and be swallowed up, and unless the greenbelt lose its inviolate nature and be further and further removed from the internal residential areas.

Dispersal Proposals

A revised edition of F. J. Osborn's New Towns After the War (1942) harks back to the earlier post-war period and is an appropriate work with which to continue consideration of new town and related proposals. This reiteration of the garden city principle rejects gargantuism of the modern city as well as the inefficiency of the depleted countryside; it does not, however, reject our industrial society. The optimum synthesis of these requires real agricultural land surrounding the presumably circular developed area.

Given a modern industrial system, the best theoretical size of the town is just large enough and no larger "to permit the full division of labor in production and distribution, of power and transport equipment on an efficient scale, and of all the social amenities that people expect of city life." Osborn states that a sufficient diversity can be obtained in the 30,000 to 50,000 range. However, he also writes that it is easier to set the limit in terms of area. A "walking" town is held to be desirable: a one mile radius gives 2000 acres. The "tolerable maximum" of city-wide density is held to be 25 people per acre. This again gives the maximum figure of 50,000.

Since these issues have been discussed earlier, let us just point out here how Osborn himself finds the economic base formulation somewhat inadequate and finds it necessary to back up his statement with a convenient area-density formula. Note also that this is an independent new town. No reference is made to a central metropolis or interrelationships between the towns: "... of all the social amenities that people expect of city life." Either considerable change in people's expectations are planned for, or vastly uneconomical projects must be provided, or we have here an inherent paradox.

The Reilly Plan (Wolfe, 1945) strikes the reader as one of the best presentations of a planning principle. There is a clear connection between the steps: the need for a better set of planning principles than those now guiding city growth, development of a set of empirically supported conclusions regarding the structure of communities, and their systematic application to city building.

Reilly finds today's atomistic and isolationist way of life as it affects the English inadequate, costly, and unhealthy. A series of institutions must be developed to counter these tendencies. First, there is the home, with greater freedom for each member as communal facilities are utilized. A group of thirty to sixty homes circle a "green" - the prime social unit. The size was decided on the basis of the historic English village with its reputed social reason, health, and coherence. At this stage, a nursery is provided, for education and health considerations and to aid the mother. Some of the greens have a church, others a park, still others a playground. These are so distributed as to assure one playground, one park, and at least one church to each four or five greens. Such a

unit of four or five greens is also provided with a community house. Three or four such groupings of 200 to 250 houses have a school, garages, and a shopping area. From his observations, he has concluded that the usual standards for a community center (serving perhaps 5000 to 10,000 people) is inadequate. A unit of one thousand is the maximum that the house can support while serving the various age groups. A civic center, in the much larger range, is also planned for.

The circulation plan on the green level is simple: only a pedestrian walk from the cul de sac leading to it. Internal walkways connect the greens. The more important streets separate the larger units.

The neighborhood density averages out to 10.5 houses per acre. This figure is derived from the plan, it seems. This is an example where density standards established have little meaning as an over-all planning principle, both because of their method of selection and their relatively narrow applicability to one social system.

While one could take issue with the specific numbers in this proposal, it remains as one of the clearest examples of one approach to the improvement of our social environment. It also seems particularly clear in the design counterpart of the social structure.

The fundamental question posed by this proposal is one which all such "eutopias" do not and can not yet answer. Can it be found acceptable by all the residents? Yes, says the author. But what is meant by 'acceptance'? Can we perhaps come to like almost any environment? And if this is so (witness the success of suburbia), can we defend the desirability of systems on the basis of their acceptance by their subjects? Placing an alternative housing type on the estate only aggravates the

problem. Reilly expects the uninitiated to live there; he thinks the manifest advantages of the more intimate life on the greens will entice them to move. There is something patronizing about this attitude. Frankly, would there be such acceptance of the semi-pastoral way of life - and if not, what kind of selective process would bring together those who did, what other traits would they have in common?

We now turn to some recent proposals for small new towns, which illustrate certain significant points. The first, Wiener and Sert's (1946) Cidade dos Motores, shows how dense residential quarters make for a city where all parts are sufficiently close together. It resembles Kohler's (1939) example, and, on a much smaller scale, Ferriss' (1954) proposal. A very pronounced system of pedestrian walks links the connected green spaces, a canal, and the main civic center to the sport and public promenade sections. Vehicular circulation is separated from this system, and also serves to define the town into distinct residential areas. The high density, 100 people per acre of developed land, is partly a result of the large number of single men housed in dormitories.

Klein's (1947) proposal is for a new town in Israel. The author deals with a more level site, permitting an almost schematic presentation. As many of the recent writers, he is intrigued by the problems engendered by conflicting circulation means. He ably demonstrates that the space open to circulating in a normal city varies with the distance away from the center, leading to the familiar congestion of in-town areas. Neither the pedestrian nor the driver can move efficiently or safely. Part of the

difficulty stems from the attempt to tie pedestrian walks to vehicular ways. These two differ in their requirments concerning safety, operate at different speeds, gradients, and the roadways can be distinctly unhealthy for the pedestrian.

These symptoms suggest that an ideal city should be planned with man, not machine, in mind, that activities be shifted away from streets, and that roads be designed solely to keep traffic moving. The remaining inadequacies of the city can be vastly improved through adherence to the following principles: establish community-oriented and integrated residential areas, and this includes harmonious industrial establishments; determine the ultimate size and population in advance in order to make a well-defined city.

The form of the town must be developed in response to the following principles. First: a flexible footpath system removed from roadways. Second: the town must be organized on a centrifugal pattern rather than a centripetal one which causes so much difficulty for the contemporary city. That is, goods brought to the city should remain on the periphery; traffic, too, should not congest in the smallest, interior part of the city. This lets the city take a definite shape and permits open planning.

The internal organization is of a neighborhood type, with nursery schools and small shops within a three minute walk of each house; eight such units are grouped together. This would provide a school and larger shops within a ten minute walk of every dwelling unit. Klein simply offers these figures as consistent with the way of life he envisages. The individual homes are served only by pedestrian ways. This is held to provide greater economy and amenity.

The Israeli seaside town is to have a population of 50,000. This is chosen on the evidence that a city of 50,000 to 100,000 is the most efficient to operate. Klein acknowledges that more research is needed on this point. A civic 'spine' runs through the residential area. On the outside, this is bounded by light industry and the vehicular circulation. At the east end, this pattern is bounded by a recreational belt and then by heavy industry; at the west by beach establishments. The pedestrian walkway system branches off the civic center, while the vehicular system has its tentacles reaching inward from the limiting roads.

One apparent difficulty with this plan (it is somewhat hard to read) is the inadequate access to the civic center, which seems to be largely reached only on foot. This is fine for the town inhabitants (although it does pose problems of delivery, etc.). But the people who come from the surrounding region might find this consequence of such interlaced circulation quite inconvenient.

While one can sympathize with Klein's wish to establish and to adhere to a carefully predetermined size, a safety-valve might have been provided. More important, the surrounding country is effectively blocked from access by residents by the transport route and by industry. However, given the Israeli conditions, the beach and the sport fields at the narrow ends may well be the only 'escape' that held any attraction.

Finally, we might point out that Klein employs a false analysis in turning his circulation pattern inside out if he has chosen a linear deployment of central functions. The argument he used, to repeat, is the standard one that more and more traffic tries to be accomodated on fewer and fewer streets as the center of the city is approached. It is this which causes

congestion. The critic usually measures this as street open space per unit area in successive rings around the center. But if the 'center' becomes a line or a rectangle (as Klein has proposed in his solution) the congestion is not a necessary consequence - in fact, it is hard to see how it would be any worse than in his program. This is simply to point out that either placing the central functions outside (as he did with traffic, the bus station, light industry, etc.) or stretching out the center would achieve the desired end. To state that both follow necessarily from the original analysis is not correct.

Linear Proposals

In the years since the beginning of the Second World War, the linear proposals have been considerably expanded and have become more complex. The linear city is particularly suited to a regional approach, and some of the plans show this kind of development as an integral part of the national and even international economy.

The MARS plan for London (1942) shows the application of linear principles at two levels. The residential areas are deployed along a main transportation artery, and are separated by parallel green areas. Then, the city itself is placed along an industrial, commercial and administrative spine.

The underlying assumption is that "all labour and material spent on distribution is unproductive ...: what is important is to reduce these losses to a minimum." An efficient circulation system will be achieved, it is hoped, through liberating from other traffic the routes on which the heavy commuting will take place. The through traffic will

will be shifted to the green areas between the residential strips. Within the main routes, there is decided separation of types of circulation: railways and lorries below, lighter traffic above.

The residential areas are just so wide as to permit walking to the main artery and the transport routes therein. Their width is therefore just over one mile (one half mile on each side of the artery), their length about eight miles. Densities increase townward, from 55 to 110 people to a residential acre. All non-residential activities (except schools and some other institutions) seem to be situated directly on the main routes.

The groups of housing have nursery schools and small shops to provide for the needs of the basic residential unit of 1000 people. Six such residential units form the neighborhood with its elementary school, health center, and church. A borough might consist of four to eight neighborhoods (between 25,000 and 32,000 people) and here one finds secondary schools, main shops, hospitals, and some local industry. The city as a whole is divided into fourteen districts of about 360,000 people. Each of these is composed of twelve boroughs, and has a technical school, market hall, and, at the outskirts, secondary industry. As one can see from this outline, school planning seems to have been high on the list of planning area criteria.

One line of criticism must be that this plan still demands a tremendous amount of travelling. This is partly the result of the length of the shafts and partly a consequence of a combination of dispersal of residential areas with the concentration of industry and of other employment points.

Again, as in several other similar plans, we must question whether the mile-wide strips of green land can serve their recreative function if so interspersed with schools, institutions and the highways. Their great

advantage is, of course, that they are less than one half mile away from each dwelling unit and thus schools and open-air recreation would be within walking distance of all people.

Hilbersheimer (1944) begins his analysis with a study of the main deficiencies of today's city. From this he develops his principles of the ideal city. First, industry is not currently located in proper relation to residences. "No thought was given to prevailing winds", with the result that air pollution and health problems are all too common. Secondly, residential areas are not planned for adequate sunlight for each dwelling unit. Personal and social ills also result from the excessive densities, inadequate playgrounds, etc. Thirdly, disorder arising from locating different uses indiscriminately produces today's traffic problem. All these are aggravated by the exodus to the periphery of the city.

But decentralization, writes the author, is unavoidable - we must plan for it. With this in mind, let us turn to the principles which he believes can make a better city. Land uses should be completely separated. The areas must be connected by efficient circulation routes. A decentralization of the city will resolve its problems, but, Hilberseimer writes, the shortcomings of centric types with their excessive distances to work and complex transport systems must be avoided. The size and type of layout will always be affected by the type of society and the area's economic base. Finally, healthful living must be a major criterion by which to judge a scheme.

The design presented is one for a linear city, with residences and institutions on the lee side of the highway on the other side of which we

find the industry. The length of the residential areas is limited: people are expected to walk to work. In the case of non-smoke-producing work zones, such as office or downtown-type areas, residences can be placed on both sides of the highway. Schools and other institutions are found between the residential areas.

This linear city does not differ too much from others in its major circulation proposals. Extensive use of access walkways rather than of vehicular streets is made in residential areas.

Hilberseimer makes a detailed study of density problems. He finds that densities up to one hundred people per residential acre can be accomodated in one-family house areas without sacrificing the all-important considerations of adequate sunlight, privacy, and dwelling unit space. There is variation, of course, with latitude (or slope of land), the type of housing used, and access requirments. He concludes that a judicious mixture of apartments and low houses can yield the highest optimum densities.

Hilberseimer is an example of the writer who, by pegging his program largely on one issue (smoke avoidance) tends to overstate his case. It is true that many of his designs would be rendered quite pointless by abandonment of smoke and gas-producing fuels. Nevertheless, his other studies do deserve attention too.

His interest in sunlight brings up the question of how important sunlight really is. Some planners, Sharp (1945), for example, stress the fact that adequate daylight might be all that is necessary. If that were so, many of Hilberseimer's ingenious arrangements would be rather superfluous, or at best could be arranged more flexibly.

Sert's (1944) proposal for an ideal city stresses the same findings and fundamentals as does Gutkind's (1943). The injunction is to break up the cities and suburbs into well-defined and well planned units. Distinctive centers (placed more systematically if compared to Gutkind) provide local and community foci. The residential units are limited in size and in relation to other zones, but again we see a reluctance to pin down the size of the entire metropolis. At the neighborhood level, size is pinned, without must questionning, to the enrollment of one elementary school: 5000 to 11,000 people. Churches, shops, recreation and a library are mentioned as facilities at this stage. The entire gamut of social services should be provided at the next. This is the township, composed of six to eight neighborhoods; it has 35,000 to 50,000 people. This is a desirable and an economic size, he concludes, by refering to master plans and to several continental theorists, and can support the light and heavy industry included here to avoid the necessity for commuting . Sert stresses the necessity for a walking scale: work, amusement, shopping, the country, must all be within w aslking range. On a yet higher level, these townships are linked to form a civic unit, and these together form the metropolis.

Again we see the combination of a relatively clear linear pattern at one level effectively related to a compact form at another. Growth can not occur through the straggling development of only one function, but, Sert writes, must proceed organically, complete with social equipment - that is, at a civic scale and pace.

The circulation net is only presented at a large scale, and here it is a clear-cut gridiron, with main roads separating the full-grown units.

The scheme is typical of modern linear proposals: a traffic and park belt separate industry from the residential areas.

Sert is not very vocal on densities. We do know that he proposes a half-mile radius limit to the elementary school walking distance. This can mean densities up to 22 people per neighborhood acre. He does make the statement that he is opposed to too open development: this splits up the area, results in excessive utility costs, etc.

This is one of several works which gets wrapped up in the intricacies of the word "organic". Sert implies that gargantuism is not "organic." He therefore, correctly, proposes the establishment of viable neighborhood units with which to build up the city. These units are to be "organic", each a microcosm of selected urban functions suitable to the chosen scale. While limits and standards are applied to the smaller units of his system, he specifically permits the larger to accrete without limit. We do not criticize this as being 'inorganic' (certain primitive systems can do this) - we simply point out that a relatively arbitrary distinction has been made and unfair as well as unspecific use of the value-laden word "organic" has been made.

While Sert favors relatively dense residential areas, the overall living half of the city would range from 22 to 32 people per acre. Since the areas devoted to residence were taken from the drawing, they perhaps are not an accurate source of information. In actuality, this is quite an open plan.

LeCorbusier's (1943, v.2, 3) proposals during the 'thirties continue along the direction shown in his earlier work. Peaks of high intensity

dominate the center of the city. There is penetration of green at every scale. The city's functions and means of circulation are kept distinct and separated. Low coverage and high density are proposed for the optimum development of the city. The Stockholm, Antwerp, and Algiers plans, and, on a smaller scale, the Nemours proposal, all typify the application of these principles.

During the 'forties, however, LeCorbusier (1943, v.4, 1945, and 1948) has a new approach, more tolerant in a way and more diverse. A synthesis of the "three human establishments", that is, agriculture, industry, and exchange, arise in modern life. Their bases are the architectural revolution and new means of transportation. The linear industrial city is the main feature, but is only one part of the total picture which, in several of its elements, approaches a poly-nucleated regional city.

The new city will no longer be characterized by crowded block , an absence of green spaces, corridor streets, and buildings of traditional design. Instead, thanks to the architectural revolution, we can have space, health, and amenity. Houses resting on pillars permit circulation underneath, tall, well-separated buildings can be better oriented and provide far more open space. The new streets, with separate pedestrian and carriage ways, the new gardens, all these will act as insulators.

The new roads serve to unify the country, the city, and work areas, and act as well to communicate ideas and social concepts. The railway lines, so far the most obnoxious feature of the city and the country, together with the nearly abandoned waterways, can be reconstructed the better to serve industry and passengers. The airplane is the fourth new means of transport which must also be incorporated into the planning scheme.

The agricultural unit is the first of the three "establishments." The aim is to make rural life more attractive and more productive. The individual farm unit, of course, is improved. In addition, social facilities are brought into the area and communications with the rest of the country are improved.

Next comes the linear industrial city. The units are perhaps five kilometers apart, and are deployed along two parallel route systems. The first route, separating residential areas from the industrial, consists of a highway set in a greenbelt, the second is composed of toad, rail, and water routes near which we find the factories set in their green sites.

The residential area here is composed of well-defined sections connected by separate walkways and roads. There are the "vertical garden city"and the "horizontal garden city", concentrations of tall apartments and low residences respectively, with certain social services provided. An existing city, town, or village might provide the core of municipal, recreation, and commercial facilities, or these might have to be built de novo, in a separate nucleus. We do not know very much about the size of these industrial towns, but from one plan for a factory (1943, v.4, p.76) we can deduce that they might consist of perhaps 15,000 inhabitants.*

These linear cities stretch across Europe, dividing up and serving the agricultural areas. At the intersection of these routes, we would find the radiocentric cities; conversely, the linear cities stretch between these. Here we find the essentials of LeCorbusier's older pattern repeated. The main routes cross in the center of the city (there seems to be no bypass). In these "cities of exchange" the administrative and commercial centers lie

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*In a later work (1948), LeCorbusier writes that a town in the 10,000 to 20,000 range, consistent with CIAM recommendations, was desirable.

athwart the intersection. The various kinds of residences surround the hub. The above principles for the metropolis apply here.

So far as the linear city is concerned, it would seem that these units could come all to close to the discredited company town. The sections, five to ten kilometers apart, are well protected and insulated in any case. Secondly, there is some question of the need for two parallel roadways (in addition to the minor roads which link the separate residential sections). Nowhere is their role, if it is different, explained or justified. Finally, the optimistic prediction of a linear city crossing Europe from Hamburg to Salonika, from Bordeaux to the Urals, etc. must be taken with a grain of salt. But if we think of the northeastern part of the U.S.A., we can see the type of pattern he was aiming at and its essential reality.

The radioeentric cities continue to show the weaknesses of his previous metropolises. While congestion certainly would be avoided in small industrial cities, here central confusion would be almost certain. We again repeat our opposition to this cruciform, traffic-based design.

But, all in all, the LeCorbusier-ASCORAL proposal strikes one as well worth attention. And in its application to a particular town (to StGaudens, for example)(1943, v.4, p.164), it shows its basic soundness. The synoptic approach, examining various types of economic base and the different forms each requires shows a higher level of sophistication than is often found.

Poly-Nucleated Proposals

In many essentials, Gutkind's (1943) scheme resembles LeCorbusier's (1945) ASCORAL scheme. Gutkind the sociologist and LeCorbusier the architect

have gone far in demolishing the city as we tend to conceive of it, yet they are perhaps the closest to reality, especially if we look at a map from far away.

Gutkind's planning proposals are deeply colored by his social outlook; it is important to outline some of the more significant points. He is, first of all, typical of those authors who express a faith that planning and control, in healthy doses, are essential to freedom. The planner must contribute to the shift away from "expansion and quantity towards integration and quality." The plan must respond t o the citizen's social needs and responsibilities. The break away from the incomplete economic man can best be achieved through a better balance of the four functions of human life (work, housing, distribution, and recreation (essentially the same as those of the Chart of Athens).

The physical consequences of these points seem to Gutkind to follow rather logically. To integrate the four functions, home and work must be close together. Large industrial establishments are taboo, and efficient distribution calls for minimization of distance, of time. To achieve "integration and quality", a neighborhood organization and structure is essential. A greenbelt plus green wedge system is necessary, since the city should be clear-cut and limited (as well as for health reasons). The need for "integration" calls for transportation lines which "exist to connect settlements /and not/ as an opportunity for settlement in themselves."

Various towns have various functions consistent with a national plan. The old subservience relationship of the satellite town is to be replaced by the different centers representing simply areas of equally important activity. With this in mind, he argues that there is no one optimum

size for a town, since each type, and relations of each type to the whole regional scheme, call for unique solutions to every unit's size problem.

The application of these principles to the planning process is well presented. Step number one is the establishment of linear elements: traffic arteries and park systems. This results in a "rational tydying up by cutting the whole amorphous mass into clearly separated sections." Standards for the recreational areas are those established by the National Recreation Association: one acre for each hundred population. (This figure and its source are almost universally accepted and show the tendency of planners to rely on outside experts.) The arteries are to be just that, and not access to individual homes or factories. This liberates the housing: it is to be placed in a more freely designed scheme.

The second step is the establishment of areal elements in the linear intersteces. Each district serves its special function which determines its characteristic layout and its relation to others. Gutkind states quite forcibly that "self-contained communities" do not exist and that, therefore, the planner should aim at the clearest distinction between the agricultural, residential, industrial and other districts at the scale of one discreet unit. He is equally vehement in his support of a parallel layer form (such as Miljutin's, 1932); a concentric growth is restrictive, inflexible, while the suggested scheme permits parallel growth of each constituent element. The final step places "point" elements. For example, certain functions appropriate to a living quarter require facilities on a relatively small site. A school, community center, shops are placed according to need, though not very much is said as to how "need" is to be measured. The distribution must take human, i.e., walking, scale into account.

This essay is certainly one of the most intelligent and synoptic ones in the field. At this point, only one or two points suggested by it will be discussed. It shows, first of all, how at a certain stage in the development of a field, the excessively simple formulationsof the first great minds no longer prove to be adequate. A new synthesis emerges, incorporating the best of the constituent elements. Thus, the previously opposed linear and circular cities are incorporated in the more realistic regional city.

His extreme relativism has certain drawbacks, however. City size should depend on city place and function. Granted. But there should be some hint as to the approach by which the relationship could more clearly be established. As a matter of fact, this contrasts rather strangely with the dogmatic statement he has occasion to make relative to city - small town relationships. Gutkind is overly impressed by the tenor of the word "subservient" to describe the current condition. How much, one can ask, real "subservience" is there today, and how will this be lessened in tomorrow's pattern?

Finally, we must take issue with the wish to set up "clearly separated sections." For one thing, is it ever possible to divide urban life into the four or five distinct functions, clear throughout? This perhaps is not so important, though a less dogmatic statement would have served the purpose equally well. But there is a related problem, ably discussed by Mumford (1938, p. 315) : the problem of regional boundaries. The core is easy to define, the limits rarely so. This might similarly apply to a city's parts. Certain activities serve more than one zone (trade schools

certain commercial establishments, etc.). Other functions can survive only in the area between major zones (pensioners' small holdings, for example), nourished, as it were, by qualities of two or more functions.

The Neighborhood Level

Let us now turn to recent studies of the 'building block' of the city: the neighborhood in its various proposed forms. Fawcett (1944), an English geographer, makes an attempt to determine the population of an urban setttlement unit. The underlying assumption is that "factors deciding the size and form are /primarily/ social."

Fawcett joins the whole sequence of writers who curse the modern city for its anonymity and its lack of social life. It is, then, an all-important job of the planner to design a unit (he calls it the "vill") which overcomes this and better satisfies the human need to belong. The town consequently must be organized of small groups, the size of which is limited by the circle of ecquaintanceship. The reader continues in anticipation - but he is let down; Fawcett concedes this is a blind alley in view of our presently inadequate knowledge.

Presumably as a temporary expedient, Fawcett recommends the following technique to reach the basic number. The education of the young is the most important community function. Children learn best when learning from each other. The opinion of teachers is that 25 to 30 children make a good class. Assuming one or two sections to a class (large schoos are undesirable) and that there is one sixtieth in each age group, the population of a vill should range from 1200 to 2400, of from 300 to 600 households. An arbitrarily set limit of a quarter mile walk to grade school sets the limit to the vill size: 125 acres, and a density up to twenty people per acre.

Since he wishes to provide denser development, the provision of recreational and other open areas poses not problem. Compactness of settlement contributes to the feeling of neighborliness which is so important to people, and also is more economic. It also helps to preserve the countryside.

Except for its recommendation for future research (though no real program is suggested), this is a inadequate work from the point of view of developing planning principles. On one hand (except for its substitution of a reputedly social rather than an economic criterion for school size), it is but an unacknowledged repetition of Perry's paper. Its reliance on authoritatively stated principles from other fields must be further examplained (the one quarter mile walk to school, for example). And, like any work which attempts to defend a thesis by positing a "human need" to support it, it must be taken with a grain of salt.

A relatively contemporary proposal from Argentina brings the hexagon system up to date. Humbert (1944, 1946) wants to plan for the auto age: safe and rapid transportation is his goal. Like most contemporary proposals, the first step is to separate vehicular traffic from the pedestrian. The roadway defining the hexagon is the domain of the car, the interior, with the exception of purely access streets, is reserved for paths. Humbert concludes that his hexagonal grid has many advantages: less area need be devoted to roads, distances connecting any two arbitrary points are smaller than over a rectangular grid, the roadway is less monstruous, and, like Cauchon, Humbert ascribes better visibility and safer intersections to the hexagonal grid.

By weighing the advantages of the large against the small hexagon, he concludes that a hexagon 300 meters (about 1000 feet) to a side is of an optimum size (the longer the block, the easier the communication, the greater

the flexibility in siting the buildings inside the block; the smaller the unit, the simpler and safer the interior road system can be and the greater the functional specialization). This size should be large enough to support an elementary school, for this is really a neighborhood type of proposal. Eavh hexagon has a definite land use. The author stresses the need to separate living and work, etc. The surrounding roads would also serve to separate effectively the individual blocks. Each type would have its characteristic internal road system. Humbert claims that one of the worst effects of the rectangular grid is that it encourages excessive division of lots. Hix hexagonal proposals show a flexible building scheme. One gathers that the total picture is one of high intensity "downtown" hexagons surrounded by units of decreasing density.

While the hexagons are adaptable to high and to low density development, he comes out in favor of the tall dense building pattern as more appropriate to urban life. Referring to Scandinavian, Austrian and Parkchester type of projects, he states that the collective green spaces which result are most advantageous.

Many of his arguments for the hexagonal system, one feels, are actually criticisms of the small block. Thus, he claims his system will permit higher speeds between intersections. But a superblock of any shape would show improvement along this line. His very choice of the foreign examples would also suggest that this really is the case.

The pattern itself has some disadvantages. There is, first, the conceded difficulty in converting existing cities to a hexagonal grid. It would seem to be only practical in extension of existing cities or in new town building. Secondly, the geometry of the hexagonal grid has the serious disadvantage of requiring contiguous blocks of almost the same size. Even with functional specialization of blocks, this might become a serious draw-

back. Furthermore, and this is quite a subjective criticism, one wonders if the scheme might not be very confusing to a person trying to find his way around. Finally, while the average distance between two arbitrary points may be less in a hexagonal scheme, a city is precisely not a system of arbitrary points. Traffic between certain places is bound to be heavier than between others - this especially in in a design which has such specialization. Much might be said for connecting such foci with straight ways. These, however, cannot well be integrated into a hexagonal scheme.

The excessive size and unmanageable nature of the city and its components attract the attention of Herrey and his associates (1944). The city, "a living organism", must be broken up into manageable units.

The form of the unit, from the examples given, seems unimportant to the authors, so long as the far more significant circulation conditions are met. The fundamental theses are as follows:

1. Community must be built on a human, that is, pedestrian scale. All points in a community must be within a ten minute walk of the center.
2. Such units must provide continuous pedestrian space for houses, social units, recreation space, etc.
3. Each building must have traffic access also.
4. Pedestrian and vehicular circulation systems must never cross.
5. The plan, the neighborhoods, and their boundaries must be flexibly drawn, since man, shifting hourly from group to group, lives in a flexible social environment.

The solution seems to be based on two basic circulatory principles: an interlacing of pedestrian and motorways is the first. The pedestrian system in

cludes playgrounds, parks, and such social buildings as schools, churches, as well; access to residential units also. In this it is very similar to the Gropius (1945) Harvard Wayland scheme, and, of course, the series of developments arising out of the Radburn plan.

The second principle is described analogously to the vascular system. The major motorways, the boundaries to the community units and the links between them, operate on a one way, steady-flow system.. Access to houses inside the communities is by extended, two-way culs-de sac.

The writers assure us that an "analysis of social activities and functions with respect to population and areas reveals that desirable unit sizes range from 500 to 2000 families ... Each unit is built up of smaller units - neighborhoods of thirty to sixty families." One gathers that they consider the full range of density possiblities as desirable in different situations.

This article is one of the best presented (the large number of pictures they could publish probably has something to do with this) and has a very logical development of its points. But one or two items should be questioned. First, note the "ten minute walking scale." Here, as elsewhere, this seems excessive. Not that the program would suffer by having a larger "scale" - the proposal's importance is that it presents, so to speak, a challenge which will have to wait measurment in an actual situation. The u se of the vascular analogy emphasizes the pitfalls which interrupt the smooth path of those intending to use biologic analogies. A one-way traffic system is tortuous, devious, confusing, and entirely unnecessary to the development of this scheme. What savings are made by keeping all intersections to one level must be lost (in terms of space) in the back-tracking of roads, loops, etc.

Gropius' (1945) first step would be to shift people and industry not needed in the city outward - to neighborhoods to be built in the country. Gropius does not make any references to form of circulation pattern in his text; from the pictorial examples we gather that, except for the one-way road pattern, he would agree with HerreY's proposals.

Neighborhood size depends on psychological contact groups. From observation of New England Town Meetings, he concludes that a neighborhood should have a population of 5000 to 6000. Several of these clustered together would make a "precinct" in the 30,000 to 50,000 range. Area limitation is set by a fifteen minute walk - that is, a half mile radius to the school and other central facilities. On the basis of evidence of the Peckham Health Center, he comes out very strongly for the establishment of community centers as the core of neighborhood life.

There is very little here with which one can disagree. It is interesting to note how wide a variety has been presented in the size of the basic group upon which social health depends. Here is an example which takes an elective political group as the measure; others have the face to face group of ten in mind.

An issue of the ARCHITECTURAL FORUM (1943) contains two articles relevant here. Miles Colean finds that much agreement exists among the disagreement between centralization and decentralization proponents. There was unanimity among his contemporaries on the necessity to consider the city as an association of integrated neighborhoods which are also well related to commerce and to industry. The neighborhood must also be protected from encroachment - that is, it must have well-defined boundaries. While the

school focus of a neighborhood is almost universally accepted, there are occassional arguments heard to keept the districts flexible.*

On the matter of schools, we hear again from Engelhardt. Economic maxima and minima for efficient school enrollment must be set. A half mile walking distance should be established. On the basis of this, a school-oreinted neighborhood has a population ranging from 1000 to 3000 families. He stresses the need to consider the important income variable: wealthy families tend to have fewer children.

While rich families can more easily support a smaller school, (if we consider the matter on strict cost criteria), this points up an interesting paradox: current trends of low density for those who can afford it create a neighborhood unit with less children.

To conclude, we would refer to the basic questioning of the neighborhood concept by Isaacs (1948, 1949). His attack is three-pronged. Is the neighborhood a sociologically sound concept? Can "neighboring" take place in the diverse urban environment? Is not anonymity (not all bad) usually the case? Is not the urban inhabitant a part of many geographically dispersed groups? There are physical questions, too. They boil down to the fact that different facilities have different service radii. Finally, there is the danger that the neighborhood concept can be used undemocratically; if successfully applied, splitting up the city into watertight social compartments.

Yet, valid as these criticisms are, the reluctance of planners to abandon the concept is understandable. For its absence would leave a serious gap in the theory as well as the structure of the city.

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*Churchill (1945) among others stresses the need for flexible neighborhood boundaries: adult groups are larger than the shool unit, and the real face to face group is much smaller.

CONCLUSION

In this final section, we shall first survey what we consider the areas of agreement. Then, we shall note the major points of disagreement. There will follow an analysis of the critique: the various principles we have touched on so far historically will now briefly be reviewed analytically. In conclusion, we shall point to areas where more research is needed.

We would like to stress that what follows are areas of agreement only. These must be distinguished from what we think are correct or adequate bases for developing planning principles. Over-all agreement may show acceptance of cultural values, general gaps in thinking, an "echo" effect, as well as thought out and critical acceptance of a principle.

One of the most pervasive themes is that the social and economic life of a city and its inhabitants reflects the physical arrangement of the environment. Such a causal relationship operates at all scales - from the house, to the cul de sac, to the neighborhood and upwards. So, the good life - whatever its criteria may be - will result from the application of good planning principles just as today's anti-social, culturally arid, and unhealthy urban life reflect the disorganization or bad structure of the city.

Can we agree to such an outlook? Are we ready to accept the tremendous challenge which this poses - a challenge which would confront us in action as well as inaction, for a definite plan as well as a refusal to act (or passing the buck to real estate operation) would so affect the citizens' environment as very much to change their lives. This is obviously a field for considerable research. It also reflects the reconstruc-

tionist aims of many of the authors, whose program can only be justified if they believe that the environment determines society.

The second area of agreement stresses one of the defects of the current urban condition. It is the essentially a-social quality of city life. This is seen to have serious consequences on the personality development of the citizen as well as reducing the efficiency of the city in that it cannot be fully utilized so long as the people remain isolated from each other. So many of the proposals for the smaller units of the city stress the rationale of the design in terms of contributing to greater social inter-action. The development of neighborliness is an oft quoted goal. The question, however, remains whether such inter-action can be made to result from physical factors, what forms it can and should take, and whether the neighborhood as a social unit is feasible, democratic, or desirable.

A development on a hierarchical basis is almost universally accepted (the early linear proposals are an exception). For example, the ideal city will be composed of a series of neighborhood "building blocks", these in turn are linked as the larger community is reached, etc. Each of the levels has a group of non-residential functions associated with it. The size of the units varies with different views of the very important social radius, with the service area of activities, etc., but the essential nature of a city remains as composed of a hierarchy of units. Since the writers stress the need to provide healthy social environments, this theme is closely related to the one above.

The limit to the size of the component units is almost a necessary corrollary to this belief. Frequently, an analogy is drawn to the biological world where excess growth is limited by mytosis. The compo-

nent units must be viable; to be so, they must be limited in size; however, there are two schools of thought as to how far this is advisable, for some authors would have the whole city limited in size while others would draw the line at an inferior level. This too is an area where suggested principles have overshot the bounds of existing knowledge and are often in the realm of speculation. As we shall suggest later, considerable research should go into the question of appropriate size of a unit.

The city according to most authors* should also be composed of areas which are functionally differentiated - residential, business, industrial, etc. Many exceptions exist in the proposals, usually for service areas or local employment opportunities in residential sections. But since these are usually limited, both in design and in their size, and since the authors feel pressed to justify these exceptions, we can say that a separation of land uses is generally acknowledged as desirable. Since most writers accept the need for clear functional differentiation, they tend to slight the fact that certain activities can only be carried out in the zones of transition or at the edge of developed areas.

The boundary between the units takes one of two forms, and most authors see a proper place for both. A green area such as a park, parkway, recreation area, or site for institutions is one, a circulation route is the other. Their importance, scale, or intensity of use will vary with the type and scale of the areas it bounds and separates.

While areas must be kept separate, there is, on the whole, agreement that they must be related. Their value and their success depends on being

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*One exception would be Goodman and Goodman's (1947) second scheme. Here he suggests development of all kinds of dwellings, factories, shops and institutions close together. In this way, he expects each use to benefit from inter-action.

mutually accessible. This accessibility, of course, reflects changing transportation patterns and today the time factor is ~~as~~ acknowledged as much as the distance.

We find uniform agreement that circulation must be "zoned" just as land uses. The different kinds of motion have different demands in terms of type of route, safety, and convenience. Pedestrian and vehicular traffic, according to most writers, must be separated, both en route and at intersections. Since they serve a different "clientele" and are for different uses, they need not be aligned along the same right of way - both are in a sense liberated to serve better.

It is also generally acknowledged that a circulation way is more than a route for motion - it serves to separate laterally while joining longitudinally*. As suggested above, there is a relation between the load and this boundary function of a traffic way. This, it is seen, applies especially to pedestrians in a vehicular world. Thus we see the frequent use of motorways as boundaries between residential areas. The scale of the circulation route is also related to the scale of the area it bounds - the larger the area that is not served by a throughway the more important, the greater the barrier action of the throughway that does bound it. This is the acknowledged price of liberation from inferior traffic.

Let us now turn to the areas of disagreement. We first note the question of open vs. compact development. We have the writers who believe that the good life is tied to the home on the land (almost always with a garden), and we have those who contend that urban life can offer alternate

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*As the Radburn experience suggests, at the final stage of the road system, the cul de sac where the driver gets out to become a pedestrian, the roadway becomes a unifying factor again.

forms of dwellings and self-expression, that the small house works against economies and purposes, (as well as the aesthetics) of real urban life. The former group would hold that air and green space in sufficient quantities must be brought to each home, and that in this manner the best of both town and of country can be made available to all. The "concentrators'" main points are that low density only removes further the "real" country which should be preserved and which is the open area which has real meaning for the city dweller. They also claim that an open development is uneconomical and that the excessive distances limit the worker in his choice of jobs. There is some variation in the nationality of authors proposing the alternative shemes, though each country seems to have, over the period, a full range. Thus, on the continent (perhaps due to the heritage of medieval cities and the developments under Bismarckian socialism) we tend to see the proposals for the highest densities. In England, the main concern is with preserving the limited amount of green land left. America has both open space (leading to the proposals as sparse as Broadacre) and the dense city with its skyscrapers (and therefore proposals such as Neutra's).

The next area of disagreement is one which concerns the relationship between towns or units. Should each be largely independent, in itself a microcosm? Or should specialization of basic function be the essential pattern? This problem becomes particularly acute when satellite towns and similar proposals are made, because the original proposals (such as Howard's) were made largely on the supposition that, given the physical adequacy of the town site, its location vis à vis a metropolis, markets, etc. was not important. Within a smaller community, a similar question arises. Is there real advantage, as some writers claim (such as Neutra or

LeCorbusier (1929)), to have complete homogeneity of building type and land use? Or can we gain by diversifying housing types and by the provision of non-residential uses at all levels (with Gutkind as the extreme proposal)?

Thirdly, it is an open question whether the planner should limit town size or not. This is directly reflected in the form proposals, with certain sector (or star) shaped and linear or poli-nucleated designs capable of accomodating growth and so designed, while essentially ring patterns are not. On the lower level of neighborhoods, it should be repeated, there is agreement that the population should be pre-established. This division of opinion reflects conflicting views of powers and capacity of planning as well as a vast variety of deductions as to optimum size of units at each level from the neighborhood up. Perhaps no phase of the development of principles shows such a confusing array of conclusions as that seeking to arrive at an optimum size of an area. In view of the agreement of fundamentals this division is indicative of the need for further research.

Optimum population per unit shows a variety of sources. One type is simply a calculation resulting from area and density standards, just as certain density standards reflect a given population and area. This view often includes consideration of a limited radius reflecting walking distance. A second series of approaches stresses the need to find an economic level of operations for facilities and services appropriate to the unit under consideration. Some writers refer to studies which assess the economic efficiency of population ranges rather than of individual services. A third criterion offered stresses the need for the smallest town which can support or attract sufficient employment possibilities to offer a variety of jobs. This, like the previous approach, rests on current information

(and information very hard to obtain), while it refers to a future, presumably better society. Therefore, it should be modified before it is applied as a standard. Very few writers stress the need to vary size standards with the type of community envisaged.

One more approach seeking to determine the population of a unit is the social one. Here the authors stress a standard such as the limit of the face to face group, or the largest group capable of acting together politically. Obviously, much more research must be done before this criterion can be fully accepted.

Density considerations arise either out of study of individual house size or a more general view of the "good life" with green area requirements paramount. There are also proposals which stress aesthetic factors. These can either result in a variety of housing types or uniformity over large areas. Some proposals in this field reflect the wish to have a full range of densities and uniformly rise to a peak at the center and decrease outward. The density considerations refer largely to residential areas with but infrequent passing comments on non-residential densities.

There is of course the full range of form proposals. There are several basic ways in which the main forms differ.

1. Massed proposals vs. those which have units separated by relatively large open areas
2. Designs haveng opportunity for or intention of growth vs. those planned for one size
3. Schemes where repetition is possible in one relatively contiguous mass vs. those where it is not
4. Proposals suitable for certain size ranges and not for others

5. Patterns vary in the ease and convenience with which major circulation routes can reach all the major areas.
6. Plans differ in their distribution of facilities and non-residential functions.
   a. These can be concentrated, or partly or largely distributed in each residential area.
   b. The units of a metropolis can be specialized by function or every unit can have some of each function - the interdependence variable.

In the matter of circulation, the basic proposals show differences along the following dimensions:

1. The degree to which they urge separation of different modes of circulation.
2. The degree to which residential areas are liberated from vehicular traffic.
3. The degree to which dependence on or freedom from vehicular transportation is urged.
4. The scale used - "human" or walking, or vehicular, in determining location of non-residential uses.
5. The scale at which there is imposed a relatively regular or easily comprehensible pattern, such as a gridiron or radial system.
6. The pattern of the smallest unit: (a) the normal, subdivided block with the street as access, (b) the superblock with at least some common land and access lanes for vehicles, or (c) groups of housing separated from the vehicular ways.

7. There are at least 4 basic street patterns suggested: the rectangular, the radial, the hexagonal, and the loose, usually topographically oriented system:

   a. The rectangular grid has come in for a good deal of criticism, largely on the grounds of its history. Some of its shortcomings are the ease with which excessive subdivision can result, the essential planlessness, dreariness, and lack of focus which has been associated with it and the tendency to apply it rigidly with inadequate regard for natural features and orientation.

      Although it has in the past led to bad lot division, a rectangular system can be developed in superblock fashion. Furthermore, while a rectangular system does result in longer distances between random points, the straight roadway can be the most practical between points of high activity. Finally, the rectangular grid has the advantage of simplicity. And when we consider that the streets need not be absolutely straight or the blocks of uniform size, the aesthetic defects could be remedied while preserving clarity.

   b. The radial or spider web system, besides reflecting well the urban reality, does seem to make for the best internal interaccessibility and provides optimum bypass conditions. It stresses the nodal points - but this has its disadvantages too, especially in the frequent absence of adequate ring roads.

This design lacks the flexibility of others if the focus of activity shifts or new centers arise, and can be constrictive if linked to a ring distribution of land uses. (of course, an adequate plan should anticipate such changes). If carried out on too small a scale, it can result in misshaped blocks and a confusing and congested traffic system.

c. The protagonists of a hexagonal system assert that it is the safest and most efficient distributive system. It increases the speed at which traffic can flow, provides for safer intersections, and diminishes the length of linear factors. It seems particularly well suited to a superblock design. A variable street scene is a direct consequence. Lastly, if planned at a larger scale, it is a design to link relatively co-equal centers of a polinucleated city.

While savings in distance do occur in connecting any two places, a city communication system is more than a simple link between random points. The system's shortcomings then become apparent as either straight roads are superimposed on the grid (in which case odd shaped blocks and complicated intersections result) or main arteries, on which the bulk of the traffic is to go, become longer than necessary.

d. A loose, possibly topographic,street system can result in an economic design. Some of the proposals certainly are

far better suited to a neighborhood level - especially if traffic-pedestrian separation is the criterion. Such a loose system can lead to far better siting. Finally, it seems to be the most realistic in that it can be the most flexible and that it can take the site into account. This type of system can be criticized on two grounds. In an area which has no topographic features alloose form can become superficial, coy, and meaningless. This particularly aggravates the second shortcoming: that the formlessness can become confusing. It is only appropriate if carried out in conjunction with a plan which can be easily grasped.

We shall now review the basic criticisms we have made as we discussed the various proposed principles. When we analyzed these physical principles historically, we presented a piecemeal critique. The form considerations are now gathered here in summary in a somewhat schematized form. As such, they do not necessarily represent any one author's design, but are considered as the "pure example".

The massed city, contiguously built up, whatever its specific form (wedge, star-like, or concentric) has several advantages. On a nationwide basis, a massed concentration can be economic in saving <u>real</u> green land. While the individual city dweller may have less access to the country than his small town cousin, one line of argument holds that the agricultural, forest and other open land can only preserve their character if kept free from periodically interspersed satellite towns. The massed city can also be seen to be economic in the use of transportation facilities. This is

particularly significant when we note that one of the main reasons for the development of the city, perhaps its main advantage, is that a large employment choice is available to each job seeker. So far as we can see from current development of cities, there are many other agglomerative advantages to close development, but with decreasing reliance on actual contiguity, and the improved means of circulation, today's massed city can, in the future, be opened up. While less concentrated, such a city will be better able to take advantage of agglomerative factors. The movement of commercial, industrial and business activity to Westchester County on New York's periphery can be taken as a case in point.

A city built essentially on a ring pattern has the advantages and disadvantages of relative inflexibility. The form can be somewhat relaxed by provision of green spaces between the main rings; this unfortunately expands the city, increases the distances and decreases the amount of green space that would be available as the built-up area increases. Of course, if the author points to an able and accurate prediction of ultimate size, the ring city would be acceptable. The historical evidence, however, suggests that a ceiling on growth is extremely hard to maintain. This is especially true for the outermost boundary. The ring city has the added advantage that two land uses, which benefit from proximity, can be close to each other over a considerable portion of the city. This characteristic of a ring city is similar to that of a linear city, especially at a large scale.

The wedge or star-shaped city can do what a ring city can not: bring some green space to the core. The open intersteces are also ideally suited for the major circulation routes which become less bother-

some than in a ring city, and provide sites for institutions, recreation, etc. close to the center but with low intensity surroundings so necessary for them. The wedge form, besides loosening up the city, is much more flexible. Growth can occur along the sectors (especially if these are functionally differentiated) and to a certain degree laterally into the green shaft. A limit to the sprawl of the developed areas can be built into the plan, for example by locating ring transportation. But the disadvantage remains that the over-all built up plus green wedge area will be much larger than that of a compact ring city. However, the difference between ring and wedge city is at least partly a phantom issue. Many of the wedge city proposals are composed of what could be considered joined ring cities, and when an actual ring city is built, there is no doubt that its outer limits may well have the hallmarks of a wedge-shaped city.

The contemporary linear proposals have as their main characteristic their expansion possibility, and they provide for an efficient transportation system as the original linear cities claimed to. The land uses which profit from proximity can be close together over the length of the city, and similarly, areas not suited to each other can be totally separated by the linear factors. There is at least a partially valid criticism that the linear form makes the provision of foci difficult.

The satellite and independent small-town proposals often suffer from unclear interrelationships. The basic questions are their relative independence or completeness of services and functions, and their place in the national or regional economy. While up to a point, these towns can be self-sufficient, for certain services they would have to rely on a metropolis and on each other. Specialization of functions does make

much sense but cannot be complete. Then, there was for a long period a belief that, given modern communications, they could be placed anywhere. But it is now realized that they must be placed with reference to the central city, and after consideration of industrial location problems.

Conceding the premises that the small, green-set town is an improvement over the overcrowded city, that a plausible argument can be made for a town-country synthesis and also that much can be gained by placing work and residence as close together as possible, there are still some shortcomings. This distribution of residence and industry does limit the choice of jobs available. It also is subject to the critique that the countryside is spoiled by their presence.

The poli-nucleated metropolis rests on the belief that an efficient specialization of functions is feasible. There is question how far this can be carried out beyond certain specialized districts such as a university center, and how desirable it would be socially. There is a risk of parochialism. There is furthermore a need to stress that various kinds of cells have different characteristics: as a result they should be placed in definite relationship to each other, be of a certain size, etc. This is insufficiently considered. There is, finally, something of a difficulty in striving for a relative independence of the units while, in each of the proposals, there is provision of an extensive and costly transportation network.

The neighborhood as a principle, reflects well the desire to break down the city into manageable units. This certainly is justified in planning terms, but is open to question when this is tied in with social reconstruction. The very variety of proposals for the "good life"

tend to open the question rather than solve the problem of rebuilding our social structure. A particular danger would seem to be in designing too sharply delimited areas, a danger resulting from the laudable wish to plan for the automotive age.

There is considerable question whether the various residents in a neighborhood (considered in terms of age, of type of economic background or along some other dimension) could be satisfactorily served within one unit. And there is the possible paradox of a homogeneous population being the only kind to operate successfully but also making for an undemocratic society.

The underlying principles are the recognition that there is an appropriate distribution of services and facilities at this level, and that the system of circulation must also reflect a hierarchical pattern of circulation load. The prime structural question, still unresolved, is whether a school is necessarily the focus of such a unit and the unit's planning basis.

Our conclusions regarding population and density were not of a kind which make easy summary possible. There was all too often a simple statement of principle without backing and a tendency to ascribe one optimum as suitable to situations without limit. We have discussed the wide variety of sources of population and density standards. None is really adequate at this point as a guide because the data on which they purportedly rest are not in a condition to be used normatively. Yet one feels they are susceptible to being studied further.

Finally, we need to stress that the proponents of a particular scheme often fail to realize that its parts interact more than they

though. This is particularly disheartening in a field which prides itself on its ability to relate variables.

To make this point clear, the appendix contains a short example of the type of schematic study which is all too rare. Here we studied the relationship between neighborhood size, school radius, and street system. As many authors hold, neighborhood size depends on school service radius. Yet the introduction of a second variable, the type of street system, can affect the size of the unit enourmously while holding to a constant radius. This second factor is universally ignored as affecting neighborhood size.

In the absence of such work, the quite exact calculations of one variable often all but loses its precision and sometimes its very significance when pitched against another variable.

In conclusion, we would like to point to some areas where further research is needed to lead to a more realistic development and application of the kind of principles we have considered. Planning being the kind of field it is, rests largely on other disciplines. We would only like to warn against uncritical acceptance of outside findings; these research areas are just that, and are not areas where economics or psychology presently hold definitive answers. What we would stress is that it would be folly for the planner to try to determine these principles based in essentially alien fields without help from other disciplines and recognition of their operating principles.

First, we often find reference to an economic criterion. A certain system, the author will claim, is more efficient than another. But until we learn how to measure welfare against cost, present enjoyment

against "long term" satisfaction, this standard must be used with considerable caution. Likewise, frequent off the cuff remarks as to the size of an agglomoration large enough to offer job diversity beclouds the fact that the author has no adequate measures in this field or criteria by which such a diversity can be measured.

Psychology today is in no position to offer but the most tentative link as to the relation between group size and processes, but a study program seeking to establish the limits of acquaintance circles, of mutual recognition groups, etc. to which so many plans refer would put the whole problem of size of a unit on firmer ground. Many other writers refer to the need to plan for people's "needs". It should be mentioned that one of the issues most puzzling to psychologists is what exactly are people's "needs"? Obviously, these are different levels, more important, these can change at different levels as new facts and experiences are incorporated in an individual's life. The wish to plan for a citizen's wants is highly laudable and even essential to a democratic order. But as the base for determining the shape of a neighborhood or types of housing, this is extremely difficult. Likewise, we need to go further in the direction suggested by the Group Dynamics study under Festinger (1948). What are the limits to "ecological determinism" - if it works at the scale of the block, what forms does it take at a city-wide level? If group formation is a function of such factors as doors, what importance does knowledge and intelligence play? In the absence of a wish to affect so much of the personal life of the inhabitant, is the planner to shrug his shoulders and let others build so as to influence along these lines?

Finally in reviewing many of the plans, one is struck more by their frequent essential similarity than by their diversity. At a certain stage, a sector system can resemble a linear one; one wonders how much basic difference there really is between the ring city at a large scale and the more recent linear proposals. The study and application of certain topological principles might resolve what are unnecessary arguments. It might also help in determining optimum area-circulation relationships and the role and location of boundaries.

The development of physical principles in planning has shown a welcome response to real problems of contemporary life: insofar as these problems are also the concern of other disciplines, their resolution should be perhaps more of a joint effort than has been the case so far.

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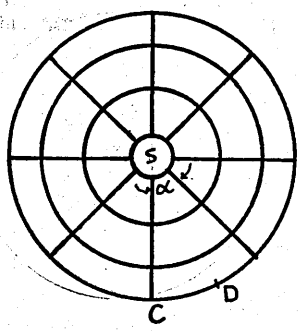
APPENDIX

This very simple example links: (a) street pattern and (b) school radius. Both these affect the neighborhood size (yet only the latter, (b), is ever considered). School radius is important because so many authors relate it to size of the unit and therefore to density and to other factors.

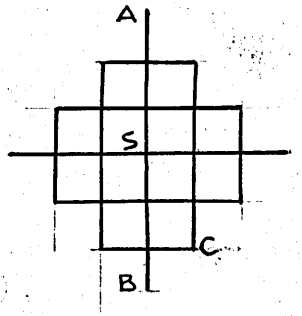
Let the maximum distance from any one home to the school be one half mile (Sert's (1942) standard, for example), i.e., "a radius of one half mile", and assume that circulation can only take place on the streets:

Street system (1) is radial, with radius SC equal to $\frac{1}{2}$ mile. The center here is always $\frac{1}{8}$ mile away from the boundary



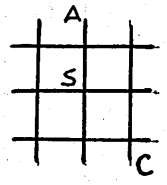
This gives a neighboerhood area of $\pi(\frac{1}{2})^2$ or .8 miles square (subject to a theoretical correction factor, which is $f(\alpha)$, to compensate for the distance CD to the intersteces).

Street system (2) is a gridiron set as a rectangular lozenge with diagnonal AB one mile. SC , to any point on the circumference equals $\frac{1}{2}$ mile. The center here varies in direct distance from the boundary from .5 to .35 miles.



This gives a neighborhodd area .5 square miles.

Street system (3) is the gridiron as usually presented. SC (along the streets) is $\frac{1}{2}$ miles, SA only $\frac{1}{4}$ miles. The center here varies in direct distance from the boundary from .35 to .25 miles.



This gives a neighborhood area of .25 square miles.

Note the considerable discrepancy which has occurred. With a fixed density, say of 30 people per neighborhood acre, scheme (1) would have a population of 15,400, scheme (2), 9,600, and scheme (3), 4,800.