Life in Supercity

The urban region has acquired a nebulous, quasi-colloidal structure in the United States.

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At no time in its venerable history has that ancient institution, the city, been subjected to so much inquisitive dissection as in the past few years. The mass media proclaim the era of the "exploding metropolis," the "urban sprawl," and the "squeeze" on land. Looming large in the literature is the word *megalopolis,* which conjures up a dark and foreboding image that rallies many of the traditional antiurban sentiments that ran strong in the past century and which provokes strong resistance from defenders of the city. Used to denote the growth and formation of super cities from the recently emergent metropolis, *megalopolis* has been elevated to a respectable position in the lexicon of geographers and urbanists by the French scholar, Jean Gottmann, in reporting a major investigation conducted under the auspices of the Twentieth Century Fund. In his book *Megalopolis* (Twentieth Century Fund, New York, 1961. 901 pp. $10) Gottmann analyzes the recent stages of urbanization of the great metropolitan complex of the northeastern seaboard of the United States, which stretches from New Hampshire to Virginia.

A paragraph toward the end of the first part of the book might serve as a summary statement of Gottman's main finding. "Urbanization in Megalopolis has covered an entire section of the country instead of being restricted to small areas within that section. . . . Thus the urban region has acquired a nebulous, quasi-colloidal structure, with new patterns of land use. The result has been called 'the exploding metropolis,' a product of 'the modern urban revolution' " (p. 167). The new patterns of land use, the appearance of traditional downtown retailing functions in suburban locations, the moves of manufacturers to exurban settings, and the overlap of commuters from different cities are the most visible manifestations of the emergence of megalopolis.

But the phenomenon which Gottmann reports is new only in the sense that it signals a stage in the development of processes at which a change of scale forces new appreciations and qualitative judgments. For growth of population is but a part of the story. Economic rationalization, in the profitable uses of capital and in the striving for higher levels of consumption along with advances in transportation technology, is the chief force spreading metropolitan life into all the recesses of inhabited areas. These processes will not end with the urbanization of the Eastern seaboard from Boston to Norfolk. They are at work throughout the length and breadth of the land.

Indeed, megalopolis is the product of the cumulative impact of a long series of choices—notably decisions to move from rural areas to large cities and decisions to locate in the less-crowded suburban and exurban periphery of metropolitan areas. Both sets of decisions arise in the desire to improve efficiency of consumption by taking advantage of the richer offerings of the cosmopolitan center or by acquiring more living space and outdoor amenity. Suburbia, as it has developed in the megalopolis, is a meeting ground for these aspirations and a trade-off of economic preferences. The movements of retailing and manufacturing are efforts to capitalize on buying power and to adjust to new costs.

Thus megalopolis does not represent a discontinuity in urban growth but an extension of forces long at work. Nor is the urbanized strip of the northeastern United States the last megalopolis. For the same drive to economic rationalization has continued to accommodate new realities and opportunities, of which two of the most significant are the jet aircraft and the increasing internationalization of the world economy. Where the growth of the strong, mercantile national state created the modern city out of the medieval burg, the international organization of capital and enterprises is reshaping the roles of major metropolitan centers. New York, thus far, has been most directly affected, but in the long run the shift from an interior hinterland to a coastal hinterland may produce other megalopolitan belts to equal the present northeastern one. Together with another set of choices—the interregional shifts within the continental United States, from North and East to South and West—the international scale of economic activities and the conquest of transport distances could strengthen other large urban complexes. In its stress on the preeminence of the Northeast, Gottmann's book does not do justice to these forces.

Although the megalopolis that Gottmann describes is, in world importance and internal cohesion of flows, the largest and most closely knit, an analysis of national and international business flows and of such indices as jet air trips shows the development of similar complexes on all the coasts. The Great Lakes industrial belt ranging from Cleveland to Milwaukee, and centered at Chicago, is one such strip; the Gulf Coast complex, stretching from New Orleans-Houston into Dallas, is another; and the Pacific Coast belt from San Francisco to Los Angeles-San Diego threatens, in its continuity of urbanization, to some day rival the megalopolis of the Northeast. Gottmann sees the northeastern seaboard as the "hinge" of the nation and the airports of New York as "the hinge articulating the domestic and overseas networks of air traffic," but the rise of other world regions to the economic level of West Europe could give rise to numerous other "hinges."

The principal thesis of Gottmann's volume is that megalopolis is a new form of settlement. However, much of his rich description of the urbanized northeastern area is applicable to the conventional metropolis. If we are passing into a period during which these metropolises will merge into superurban complexes, policymakers will reasonably ask a number of questions of the urbanist. In general, they will wish to know how inevitable, and desirable, the

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present pattern of settlement is. In particular, they will raise questions such as these: Will there be room enough for people to live at the desired densities within reasonable commuting range of the hub of activity? Will all open space (for contact with nature and recreational uses) vanish? Will present local governments be swallowed up by huge supergovernments? What will be the role for the renewal of old city areas?

An Unexplained Paradox and Other Questions

Gottmann does not give unequivocal answers to all these questions. Yet his descriptive material has raised the issues sharply for many of the practitioners who would seek normative solutions to the problems of urban settlement. For example, in the midst of this consolidation of metropolitan functions in the United States, there is evidence of a paradoxical thinning-out within individual metropolitan areas of the largest complex. Gottmann finds that "Although Megalopolis covers only a section of the whole northeast, most of the declining large cities are within it." He suggests that this is in response to the fact that some of the most crowded places are found in this region and that migration within the region is a solution to the congestion. He does not indicate within what limits this response is to be expected, or how far it may go. But sociologist Henry Cohen has noted that the present density of Manhattan is only 25 percent higher than the gross density for all New York City in 1860. In the past century the average consumption of space by nonfarm households has apparently risen; will it continue to do so as incomes increase?

What of the end of open space of which we have been warned by W. H. Whyte, Jr., the New York Regional Plan Association, and others? Gottmann is neither pessimistic or alarmist. On the basis of land use totals, he makes the following observation: "It would be safe, nevertheless, to assess land uses in Megalopolis in the 1950s as follows: about one half wooded (including this time parks outside cities), one third actually used in farming (either tilled or grazed), and about 15 percent devoted to special uses (chiefly buildings and roads)." While he is aware of the greatly increased appetites (and means) for recreational experiences of "the common people in this area," appetites which he feels cannot be satisfied by "the green space available within urbanized districts," he does not find these in conflict with the restrictive partitioning of the land by zoning. The latter, he says, "is in many respects necessary."

The New York Regional Plan Association, on the other hand, feels that zoning, particularly large-lot zoning, has gone much too far in suburban fringe areas. Its staff points to restrictive acreage zoning in suburban and exurban communities in the region and argues that if this present pattern is maintained, all available open space will be consumed by 1990, merely to accommodate the expected future population of the area. Although it is unlikely that existing zoning will hold up under the economic pressures which will be generated by the population pressing against these limits, the issues of stabilization and conservation—the allocation of scarce land among competing uses—will be the subject of contention between interest groups, and especially, between local governments.

Edward Higbee, who contributed heavily to the chapter "Megalopolitan Agriculture," has written a popular book, *The Squeeze*, in which he pleads the case for holding some of the suburban lands out of subdivision entirely, even at the price of higher densities in residential areas. That the case cannot be made on the basis of an irreparable loss of agricultural production is evident from the findings of the chapter in which are paraded greatly increasing yields in truck farming and garden crops and a general rationalization of food production which will permit the feeding of much larger populations with the same or reduced land acreage. Higbee puts the issue in terms of flood control, the preservation of wild life, and the amenities of nature experience, but others argue for a more "fundamental" place for agriculture.

In California, particularly, where the tides of urbanization vie for the coastal plains and gentle slopes occupied by artichokes, plums, apricots, and vineyards, the intrusions of megalopolitan settlement are denounced as "slurbs" and bitterly resisted by conservationists. For others there is the basic question of the value of keeping fringe areas in agriculture. Such land is of dubious value as recreational or other open space, for if it is productive, the public cannot have access to it, and it is difficult to prove that it is needed for food supply or that it yields high tax revenues.

Metropolitan Organization

The above-mentioned issues are not likely to be settled, in the early phases at least, by some megalopolitan government. In each of these giant complexes, old local governments have enjoyed remarkable immortality. Cities have grown by annexation, and where they have not added to their political domain, area-wide "functional," limited-scope governments have grown up. As early as 1910 the Census Bureau recognized the "metropolitan district," by 1950 it marked Standard Metropolitan Areas as meaningful units, and in 1960, it identified two Standard Consolidated Areas (New York and Chicago). Within all of these larger units there is a growing class of functions that is handled on an area-wide basis. The most prominent of these now developing is urban transportation, particularly mass transit. Where in the past, political merger sometimes attended functional marriage—for example, when, at the turn of the century, the Greater New York was amalgamated into what is now the city—megalopolitan transit or air pollution control is likely to remain a matter of single-function agreements. Though annexation by central cities is still practiced, it is most active in nonmegalopolitan centers like Oklahoma City, which, in the last few years has increased its area about 500 percent by this device.

Gottmann considers these processes of extending the scope of a single jurisdiction subject to severe limitations, and he accepts the view of Sayre and Kaufman that such extension might weaken rather than strengthen local government. But he gives the verdict that metropolitan organization is "in flux." At the point of the difficult questions of dynamics, either political or economic, this volume stops short. Megalopolis, the prospect of the future, is traced in the record of the recent past, but the "laws" by which it has arrived are incomplete.

The method of the geographer is to

isolate and describe the chief symptoms of the developing pattern of settlement. But the city is the setting of much of human activity—in the United States seven out of ten persons live in cities. Though Gottmann realizes that the "dynamics of urbanization" are largely economic, there is no economic "dynamics" in his volume. Social and political forces are even more sketchily introduced. The mapping of the extension of settlement and the drift of densities gives us the symptoms, the surface phenomena. The social data developed in the chapter "Living and working together" leads to no particular insight into the social forces of the new megalopolis. In the important task of laying bare the workings of the city, Gottmann's book is inferior to the economic reports of Hoover and Vernon and the political case studies of Banfield and his students. The social dynamics of the suburb and the urban village must be found elsewhere, chiefly in the work of Gans.

As a contribution to the studies of spatial occupancy, however, this is an important, perhaps monumental, compendium crammed with useful, and often suggestive measures of the form of settlement that is coming to dominate the American, and perhaps the world, scene.

Applied Mathematics

Numerical Methods for Scientists and Engineers. Richard W. Hamming. McGraw-Hill, New York, 1962. 411 pp. Illus. $11.

"The purpose of computing is insight, not numbers" is the slogan frequently shouted in this delightful, very readable, intermediate book on numerical methods. Except for a few cases, such as in the computation of engineering design data, few of those experienced in numerical analysis will disagree with the tenet that the vast disgorgements of electronic computers are not ends in themselves. Unfortunately, the computer user, under pressure to deliver early answers, seldom has time for reflection on the choice and careful planning of the computational aspects of a program. Thus, the author does a potentially receptive readership a service by repeating this maxim often.

That the author is concerned with the significance of the numerical output of a computer is most amply illustrated by his presentation of a variety of effective methods for treating errors that arise in many sorts of computations. Round-off errors (or computational pseudonoise), goodness of fits of polynomial approximations for variously spaced data, a method for finding error terms of general formulas, errors in numerical quadrature and in numerical solutions of ordinary differential equations as well as their stability and instability, least squares, Fourier approximations, curve fitting, filtering by numerical "band-limited" functions, and errors in approximation by sums of exponentials are some of the topics ably dealt with. The author also gives several practical heuristic alternatives to the frequently used and frequently pessimistic upper bounding of errors by sums of upper bounds on the component errors.

A certain air of informality that, with the exception of *Practical Analysis* by C. Lanczos, is seldom encountered in books on numerical analysis is exuded by the author's frequent remarks about his experience and by his opinions. Here and there one sees neat tricks of the trade and finds discussions of topics not usually found in texts—for example, the summation of series and the above-mentioned band-limited functions. Simplicity is a guiding principle throughout the text; huge computational examples do not appear, and the use of special operators is kept to a minimum. For greater depth of treatment on a number of topics it is necessary to consult such books as those of Householder, Hildebrand, Kopal, Collatz, Henrici, Forsythe, Durand, and Nörlund and perhaps also to consult journal articles. Hamming's presentation includes many suggestions and allusions, but not quite enough elaboration in many places. He is, however, very careful to call attention to this, and he supplies ample references for further intensive treatment.

A few negative aspects, primarily on the point of emphasis, should be mentioned here. Although the author indicates (on page 8) that old-style interpolation is rarely used, he makes considerable use of the method in chapter 1; some is necessary, but perhaps not all. Space devoted to Stirling numbers and the digamma function could have been used to provide information on continued fractions, a useful tool in modern efficient approximations, and more attention could profitably have been given to other topics—linear algebraic numerical problems, boundary value problems, eigenvalues, and summation of slowly convergent series of positive terms. Moreover, at least something might have been said about partial differential equations. The interaction between word length in a computer and the method chosen for the solution of a problem is not noted. This is a serious omission in a text concerned with methods for use on large-scale digital computers. With the exception of questions related to stability, round-off noise may be overemphasized; in fact, its treatment is a bit inconsistent with the hint (on page 39) that possibly its intensive analysis is a waste of time. Finally, the poor treatment accorded Monte Carlo methods should have been omitted, for extensive literature on this field is available.

This is not a cookbook or a reference book, and it will possibly require amplification (of its depth of treatment and examples) by an instructor if it is to be used as a textbook. However, with such amplification, it would be a very usable and admirable text. It could well be considered a supplement, or more aptly a complement, to other textbooks, and it will be a worthwhile part of a computing man's library.

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Intermediate Astronomy

Fundamentals of Celestial Mechanics. J. M. A. Danby. Macmillan, New York, 1962. xiii + 348 pp. Illus. $8.

Good textbooks on intermediate astronomy are in short supply these days. It is a great pleasure, therefore, to find that I can recommend highly Danby's new text on celestial mechanics. This clearly written book covers, in 14 chapters, all the celestial mechanics with which every professional astronomer and senior space scientist should be acquainted. It covers no more because, as the author states in the preface, it aims to be a direct elementary text rather than an encyclopedia.

The book begins with a chapter that defines the astronomical terminology to be used later; the next two chapters