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Discussion

Comments on "Relationship of energy and complexity and planning architectural design" [Architectural Design 10 (1972) 624–629]

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In the early days of Dr. Howard T. Odum's second tenure at the University of Florida, he threw a large net over many disciplines with his systems theories and attracted many faculty and students interested in his new and unorthodox approaches to understanding the interactions of man and nature. I was one of those faculty, teaching in the School of Architecture, who confirmed by degrees what my intuition told me was an exciting and viable approach to studying my own areas of interest in architecture and planning.

From graduate seminars, faculty seminars, collegial conversations, and later many friendly meetings, I learned enough of systems ecology to work with Dr. Odum on several research projects and I introduced him and his thinking to several graduate students and faculty in my field of architecture.

My attempts to understand urban growth processes as an organic process, subject to the laws of the universe just like everything else on this earth, were stimulated by both Dr. Odum's energetics modeling and the recent availability of better aerial and satellite images of urbanizing landscapes. Dr. Odum suggested that we apply the concepts and principles of coral reefs and oyster reefs, as examples of animal cities, to the analysis of human animal cities. At the time we had a group of masters students in architecture studying Ft. Myers, FL, a rapidly developing area in southwest Florida as part of a studio planning exercise.

An article co-authored by Odum and me emerged from our conversations and was published in a special issue on complexity in a British architectural publication, "Architectural Design" or AD for short. In the field of architecture in those days, AD had a reputation for being avant garde and was read by many young educators and students in the US. It was the appropriate forum for our ideas.

In the article, we laid out the premise for studying human cities as organisms, established basic definitions and a set of eight principles based on energy and complexity in ecological systems: (1) power basis for structure; (2) useful power maximization; (3) succession characteristics; (4) characteristics of climax; (5) power concentration and energy loss; (6) power density gradients; (7) control of system quality by type of power source; and, (8) unnecessary complexity. In addition we proposed set of five "Tools for Measurement of Power Expression and Complexity in Regional Plans," because five was all we could come up with at the time. The five "Tools" we proposed were: urban structure edge index; regularity of margin between urban structure and open space; urban structure density; power density; and density of stress. These principles and tools were then applied to the study of Ft. Myers which was already underway.

The result of this quick study, and the conclusion of the article, was a list of nine "Possible Characteristics for Planning a Climax City." While these look rather unexciting to us now after experiencing the

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breadth and depth of Dr. Odum's life work, they were relatively revolutionary in 1972, especially for the disciplines of architecture and planning. Unfortunately, as studies of the energy basis for the dynamics of urban morphologies, they did not have much impact on planners who spend their time trying to understand the dynamics of political, social, and economic systems and how those factors affect what becomes the built environment for pen-raised humans.

These studies did have a lasting effect on some architects who were looking at design and construction from a systems perspective and they are still practicing today. Sim Van Der Ryn, architect and professor at University of California Berkeley and author of "Ecological Design," and Pliny Fisk, Director of the Center for Maximum Potential Building Systems in Austin, TX both recognized the importance of Dr. Odum's work in the 1970s and were reassured by knowing that a scientific and mathematical basis for their own intuitively guided investigations existed and was being further developed.

Realizing that urban systems were not "dumb" systems, either in their non-human and scientific aspects, or in their messy and variable human dimensions, Dr. Odum repeatedly stressed the importance of the role of information within the system, even though it was very difficult to quantify and measure. All of our urban regional models had an information storage, expressed as the information contained within the design of structure and the information floating around in the human heads making decisions about urban growth and development. Later, I realized another aspect of information that our earlier study had left out—the long-term cultural information value of design quality in built structure—and its importance to long-term stability, energy efficiency and sustainability. In the cultural context, built structures with poor design quality are not preserved because they have little value to society—either perceived or economic. If they are dismantled and recycled, the information in their built forms is obviously not valued by society, and therefore, discarded. The junk yards of the world are full of these architectural "experiments", some of the road sides as well, but that's another story. The loss of these structures can be bad news for architects and designers. However, built structures that have high design values to society are more likely to be preserved and continue to function productively for decades. The secret seems to be in the "design information" of the built structure and its flexibility and usefulness as a contribution to adaptiveness and sustainability.

A new design paradigm that takes Dr. Odum's systems energy principles and concepts as its basis could develop a vocabulary of form that accommodates urban system dynamics over time and adapts to changing energy supply and environmental conditions—an architecture with evolutionary programming built in. In light of the pending energy crises, increasing population pressures and losses of environmental quality it would seem that such an architecture is long over-due. The most recent projects in "Green Architecture," now in many countries including the US, hold some promise and hope for the future.

References

Odum, H.T., Peterson, L.L., 1972. Relationship of energy and complexity and planning. Architectural Design 10, 624–629.