Architectural Practice in an Emergent Paradigm: Opportunities for the Provision of Built Ecologies

by

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ABSTRACT

In the design and evaluation of buildings in current standard architectural practice, the envelope is treated like a liability in terms of managing energy flows rather than an asset for potential application to building systems. The performance of building environmental control systems (ECS) is currently designed to compensate for diversions from thermal comfort, which are largely[1] generated by the interaction of the climate[2] with the building envelope. The measure of building energy performance for compliance with regulatory agencies[3] encourages the use of industry standard tools that imply an evaluation of *sustainability* as *ecological viability*, but that primarily promote *energy efficiency* (ASHRAE, 2010, pp. 4-5). Energy efficiency and ecological viability are not the same: the path to energy code compliance in standard architectural practice prescribes efficiency in the quantitative sense of the first law of thermodynamics. The regulation of energy efficiency tends to focus exclusively on the goals of energy conservation for systems that are modeled as closed thermodynamic subsystems, thereby dissociating *built systems* and subsystems from each other, and from their surrounding environment and mischaracterizing building metabolism through the mechanical reduction of a potentially complex, multi-variable condition. Conversely, a measure of ecological viability would be concerned with a qualitative relationship between systems and their environment, matching *effective* energy transfer with multiple synergistic requirements.

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[1] Building occupants, equipment and lighting also generate thermal loads in current modes of building energy analysis.

[2] Climate, for the purposes of building energy performance analysis, is represented by standardized sets of typical hourly weather data.

[3] The Energy Policy Act of 1992 introduces the intent to regulate energy performance in buildings. Prior regulations are concerned primarily with issues of life safety.

If the goal of sustainability is to create ecologically viable built systems or *built ecologies*, then buildings should be re-imagined in an *emergent paradigm*, wherein the energy from variable *bioclimatic flows* is effectively coupled to building energy demands.

The intent of this study is not to propose that built systems should be literal analogues to *natural ecologies*, but that in order to approach ecological viability, we should better understand the characteristics of ecological energetic transactions in order to identify physical behaviors and mechanisms that might be applied to built systems, enabling the location of the products of architecture on a continuum of *more* or *less* ecologically viable (Prigogine qtd. in Lane, 2006). This understanding should inform the clarification of goals and the subsequent reconfiguration of the modes and means of architectural design and evaluation with the purpose of accommodating more complex systems in terms of the types and scales of energetic transactions and system boundaries that are more effective at maximizing the potential application of bioclimatic flows of energy into building systems. In order to maximize the conversion of potential energy on a given site towards effectively meeting building energy demands, there must be a means of understanding a complex set of potentially applicable energy flows and mechanisms of transformation and storage by the building project team involved in the earliest phases of design. Impediments to the application of synthetic bioclimatic analyses are considered through the investigation of a case study for a medical center designed by a state of the art architectural practice. Entrenched in educational, professional, economic and regulatory institutions supporting the production of the built environment, the impact of the mechanical bias on the potential production of built ecologies is assessed.[4] The case study is emblematic of current best practice for major architecture and engineering firms engaged in international practice.

[4] Life cycle analyses for materials will become increasingly important as dependence on concentrated fuels is minimized; however, the focus of this study is the ecological performance of built systems in the use of ambient energy flows for the provision of heating, cooling and lighting.