EDITORIAL:
An Agenda for Building & Environmental Technology Research in Architecture

We have now well established in these pages the four broad areas of research focus under the umbrella of architectural research: Design Methods, Building & Environmental Technology, Environment-Behavior Studies AND History/Conservation Studies. In the previous issue, we began our dialogue on setting the research agenda for the "Design Methods" sub-field of architectural research and promised to deal with each of the other three sub-fields of inquiry in subsequent issues. We keep the promise here, by continuing our conversation, this time in the "Building & Environmental Technology" (BET) sub-field.

Although research in the "sciences" of architecture has a very long history (cf. Tzonis and LaFaivre, 1975), much of that tradition lies obscured behind debates on architectural styles in the recent past. Modernism which came in the wake of a long succession of "styles" rejected many of the notions of styles, and was instrumental in the institutionalization of "architectural sciences:" a pre-cursor to BET.

The first modern educational program in the architectural sciences was established at the University of Sydney, Australia, in 1953 (Gero, 1993). The establishment of higher and more detailed research goals was achieved with the formulation of Ph.D. programs in architectural technology in the early 1960s. There again, Sydney lead the way.

With the institutionalization of research in the field, more specialization occurred in the early 1970s. One of the pioneers in specialized BET research was the doctoral program at the University of Michigan, USA.

A classification of dissertation topics in the field reveals that early concerns were mainly with individual building materials. Thermal, acoustic, and lighting behaviors of building materials followed suit, and eventually evolved into research on the building envelope. The energy crises of 1974 and 1979/1980 also produced a flurry of activities in energy conservation techniques.

While the research agenda seem to have taken specialized focus, many people within and outside the research sub-field began to raise doubts about the net results of all these activities. The problems have had to do with one of the following three attributes of research: methodology, basic assumptions, and the end products.

The most vociferous objection comes from architectural practitioners who contend that the end-products of BET research are of little practical use to the making of architecture. Architects point out that the findings do not help them in their initial design activities: only as design limitations and often in the form of requirements that must be met. Hillier et al., (1984) who analyzed these and other shortcomings point out that the fault is not so much with the end products themselves, but in the basic assumptions and the methods employed.

An illustration may bring out the point more clearly. Analyzing the thermal comfort conditions in the so-called "energy-efficient" houses in Australia, Samuels, et al., (1993) found a significant discrepancy between what researchers assume to be the need for thermal zoning (i.e. what activity faces what orientation) and user preferences. They pointed out that users of these "energy-efficient" houses preferred to worry about winter comfort, as opposed to summer discomfort which seems to be the primary concern of researchers. They also noted that users preferred different zoning for bedrooms than what was provided by the researchers.

There seems to be two problems with the basic assumptions of researchers in BET: wrong prioritization of research goals as shown above, and inadequate understanding of the design process, as shown by Hillier, et al. (1984). Many BET researchers assume that design proceeds along a linear path and more and better information will somehow lead to better buildings. This is patently wrong. As Hillier et al. (1984) point out, researchers must account for the fact that design is essentially conjecture-making. The tools we develop for design must facilitate this attribute of design. Additionally, we need to listen to the real needs of users, as opposed to their perceived needs.

The fundamental issue here is the re-formulation of research questions. It seems that the first question to ask is, "what is it that we are trying to solve?" We will then have to answer an even more basic question: "will the end product we anticipate help designers in their form-making activity?" An understanding of the essence of design process is necessary to answer the second question.

Hillier et al., (1984) propose the notion of "building-as-hypothesis." In this view, design is set to proceed in a "hypothesis-formulation, testing-of-hypothesis" mode. Some aspect, attribute or phenomenon about the design problem strikes the designer as peculiar, he/she therefore investigate the matter further, and then proposes a "solution," tries it out either diagrammatically or in a mock-up, and then discard/amend/accept the solution. It is in formulating hypothesis (step two, above) that designers look to the "sciences" for tools that help formulate better and more holistic conjectures. The end products of our research efforts should be tailored to this need of the designers: help them make better conjectures about the designed reality.

Furthermore, BET researchers need to re-examine their traditional assumptions. How important is it to let sun penetrate the building? What are the real psychological and physiological impact of current standards for HVAC systems? How important is daylight in the mental well-being of occupants of large, internal load-dominated buildings? Do people really have such narrow tolerance limits for thermal comfort as our environmental standards have us believe? If they do, are there possibilities for variation between different building zones? What kind of migration occur within buildings over the day? Do certain materials and construction techniques really conserve energy or do occupant behavior infringe upon energy efficiency? If so, to what extent? These and other questions will begin to help us understand some of the behavioral and psychological issues underlying building and environmental technology needs.

On a final note, we must caution the reader to keep in mind that modern research in BET is at best only about forty years old. True enough, the research output has not had major impacts on everyday designing and living. But it is also relatively young, and as such, needs nourishment. The agenda proposed here is only meant to make it more attuned to architects' and clients' real needs, not to destroy the excellent efforts already made by workers in the field.

References:

Gero, J., (1993). "Forty years of architectural science," *Architectural Science Review*, 36(4): 149-150.

Hillier, B., *et al.*, (1984). "Knowledge and design," in, Cross, N., (ed.), *Developments in Design Methodology*. New York: John Wiley & Sons, pp. 245-264.

Joroff, M. & S. Morse, (1984). "A proposed framework for the emerging field of architectural research," in, Snyder, J., (ed.), *Architectural Research*, New York: Van Nostrand Reinhold, pp. 15-28.

Samuels, R., J.A. Ballinger & R.J. Williamson, (1993). "Thermal zoning in solar efficient design: experiences and designer preconceptions," *Architectural Science Review*, 36(4): 151-156.

Tzonis, A., & D. LaFaivre, (1975). "The mechanical body versus the divine body," *J. Architectural Education*, 29: 4-7.