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Structures Teaching Polarities: Seven Teachers' Responses

Ochshorn: "Perhaps there is a more useful framework within which the teaching of structures can be debated..." It is curious that both poles of the argument seem to regard structural "intuition" as a natural outcome of their pedagogy. At one pole, the presumption is that mathematics foster "an intuitive sense of how structures work." But the types of mathematical models architecture students are likely to encounter (statics of determinate structures; simple shear and bending stress) will elucidate only a limited subset of structural types. Furthermore, being truly creative with structures requires, as Candela has said, years of effort and study.

At the other pole, intuition is presumably gained through direct observation. But examining instances of structural behavior, whether through models, case studies, etc., will not by itself foster intuition about structure; at best it will only serve to canonize that particular selection of structural types. It is certainly true that one gains insight into the behavior of a frame, for example, by subjecting it to various loads and watching it deform. No one would argue that this type of investigation should only proceed by mathematical modeling. What is not at all self-evident, however, is that in the absence of a more rigorous mathematical apprenticeship, students can extrapolate from these specific cases to create new, significant or even appropriate structural form in situations that they have not previously encountered.

While it is true that the creation of innovative structural form may not be an issue in the vast majority of buildings that are actually designed and constructed, and that the pragmatic selection of appropriate standard systems and sizes is a legitimate concern, our responsibility as educators goes beyond providing guidelines for off-the-shelf structures and the packaging of conventional wisdom that passes for "intuition." At the same time, engendering a false sense of competence by providing a superficial mathematical gloss on the subject is not a satisfactory response. The issue of how to teach highly technical subjects is often formulated in terms of the polarities presented in the first issue, i.e., math vs. intuition, or real world vs. abstract theory. Perhaps there is a more useful framework within which the teaching of structures can be debated. As I stated in a paper on this subject presented at the 1990 ACSA Technology Conference, we should attempt to define what exactly constitutes structural *literacy* for our students; and to make the careful distinction between literacy and the idea (ideal?) of structural *competence*. As Leon Trilling has written: "We are literate in a discipline when we understand its presuppositions, its research techniques and some of its more important results. We are competent in it when we are able to use it for our own purposes." If, in fact, literacy in structures is the goal of our teaching, then elements drawn from both mathematical and physical modeling (one pole), as well as some distillation of the conventional wisdom about "real-world" concepts (the other pole), would necessarily be included within the structures curriculum, each to the extent that they reinforce this goal. *Jonathan Ochshorn, Department of Architecture, 143 E. Sibley Hall, Cornell University, Ithaca, NY 14853.*