

STRUCTURAL EDUCATION  
A NEMESIS TO ARCHITECTURAL EDUCATION

by

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## STRUCTURAL EDUCATION: A NEMESIS TO ARCHITECTURAL EDUCATION

### INTRODUCTION

During this century, the study of structures has been a part of almost every architect's education. In the schools of architecture, the configuration of the structural curriculum has varied over the years, but there has always been a recognized need for the student to acquire some level of structural knowledge. The question which has been raised in recent years is not whether structural subjects should be a part of architectural education; rather, the debate centers around the subject's general content, the level of skill to be acquired, and the method of presentation.

Prior to the mid-nineteenth century, structural design was primarily empirical and intuitive. Structural knowledge was passed on from the experienced practitioner to the apprentice. Around the middle of the last century, the era of empiricism started to give way to the more formal theoretical approach of structural mechanics. This transition paved the way for the introduction of formal structural studies into the classroom. Most of the schools of architecture continued to place great emphasis on structural studies up until the 1950's. Generally, these studies were centered on the very formalistic theories of structural behavior. Due primarily to the rigor of the mathematical analysis of structural systems, very little time was devoted to the creative aspects of structural design.

During the last twenty-five years, the schools of architecture have attempted to break away from the formalized engineering approach, some-

times referred to as the "Theory of Structures," in search of a more creative approach to structural education. In most cases, the break away was complete, but the search goes on.

In this paper, I will attempt to identify the pertinent aspects of the problem of teaching structure to undergraduate students and propose a solution to the problem. The proposal is not necessarily unique. It has been heavily influenced by the thinking and experiences of others. This influence has been both positive and negative, but even negative results can lead to pedagogical progress.

My attitude toward structural education has been influenced by twenty years of engineering and teaching experience in the field of structural design and analysis. During this period, contact with engineers, architects and students of both professions has left me with strong feelings about the goals of structural education and the means through which these goals might be achieved. I do not wish to imply that the analysis and proposal presented in this paper is in no way errant. A workable solution can only be developed by application, evaluation and continual improvement through experimentation.

## DISCUSSION

### Structural Education: The Past and the Present

Before the middle of the nineteenth century, structures were designed and built on the basis of empirical information and intuition. Although I am sure that there were many catastrophic failures, there were also many beautiful and structurally correct buildings erected. Many of these buildings are still standing today.

During the middle and latter parts of the nineteenth century, statics and the theory of elasticity became more formalized and these subjects were introduced into the curricula of the schools of engineering. The need for structural training for architects does not seem to have developed until the early part of the twentieth century. This need arose out of the "modern movement" in architecture and the trend toward the exposure of structure in the buildings. The architectural schools borrowed from, or employed directly, the structural curriculum of the schools of engineering. The structural training during this period might have included physics, mathematics up through differential equations, statics, dynamics, two courses in the mechanics of materials and perhaps three or four courses in the design of steel, timber, and concrete structures. This series of courses constituted a very rigorous program of study which provided students with the structural knowledge needed plus the confidence necessary to apply the knowledge in the analysis of existing structures. Considering the society as a whole and the students in particular, this program of structural studies was appropriate for the time.

The period around the turn of the century and leading up to World War II was an exciting time from a structural point of view. New appli-