

The Museum of Modern Art

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THE WORK OF FREI OTTO

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Frei Otto is concerned with the fundamentals of structure. In pursuing the age-old question of all construction—how to achieve more with less, that is, less material and effort—he has elevated the traditional tent to a modern building type capable of remarkably large spans. Frei Otto believes in modern technology, and, from the beginning, envisioned structures of extreme lightness as well as extreme strength, which were to make optimum use of new materials such as thin cables of high-strength steel or thin membranes of synthetic fabric. He also saw the potential of pneumatically distended membranes, the only building type considered suitable for extraterrestrial conditions.

During the millennia in which man had to rely on gravity to give buildings stability, the enormous amounts of material used were disproportionate to the actual loads that vaults and domes had to carry. Even in modern shell structures the dead weight of a dome equals most superimposed loads. Frei Otto arrived at structural solutions that, for the first time, reversed this ratio.

Since the beginning of the modern movement, architects have admired engineering structures for their geometric purity and monumental scale. Frei Otto's involvement is more direct and marked by an intuitive understanding of the physical properties of structure. For a single project Frei Otto produces innumerable system sketches until he has covered all theoretical aspects of the given structural type. In a parallel approach, he strives to exhaust all practical applications suggested by analytical examination. In many respects, Frei Otto shows less the characteristics of the planning architect or the calculating engineer than the speculative mind of the inventor. His design approach is oriented toward the development of structural prototypes rather than the establishment of universally applicable canons of form.

Frei Otto has been said to approach form from the knowledge of structure rather than the love of sculpture, while he himself has repeatedly stated that his forms are simply the result of meeting specific tasks. His denial of artistic motivations is believable to the extent that he avoids burdening a project from the outset with preconceived ideas. He admits only to a personal style in problem-solving, his forms being the automatic results of the design process. Nevertheless, the forms of the executed tent and pneumatic structures seem not only distinctly sculptural but also stylistically consistent.

Frei Otto's theory of minimal structures has been summarized as an attempt to achieve, through maximum efficiency of structure and materials, optimum utilization of the available construction energy. As a consequence he sees the architect less as a designer than as a manager of this energy, which is the sum total of material and labor involved in construction. However, economy was not the only objective in developing lightweight systems; internal flexibility is increased, as well, by the reduction in construction elements, which allows the adjustment of space according to changing needs. At the same time, tensile structures, which are easily expanded and transformed, also provide external adaptability, not only to specific site conditions but to environmental requirements in general. The facility with which these structures can be erected, dismantled, and transported offers further advantages for increasingly mobile societies. Frei Otto considers the temporary nature of his membrane structures a favorable aspect, since limited urban and suburban space will require every building constructed today to be replaced at some point. This endorsement of obsolescence contradicts the traditional view of architecture as a fulfillment of man's need for monuments. Yet, as vernacular buildings of all periods prove, artistic value is not dependent on the durability of a structure, nor on the amount of preciousness of its material. On the other hand, temporariness does not mean improvisation as is evident from the amount of research invested in each lightweight structure.

Frei Otto acknowledges that current scientific methods have advanced only far enough to deal with elements of structure and to guarantee perfection in buildings that exclude the human element such as an automated factory. Since the decisive factor in the design process, in his opinion, is the analysis of the problem, he believes that progress depends on new analytical methods. The predicaments such a new science faces are the innumerable nonobjective factors that enter building as well as any other human activity. They must be accommodated if the scientific criteria are to succeed in re-establishing the primacy of human needs.

Ludwig Glaeser