

## PREFACE

### Collapse and Failure of Structures

This special issue of the *International Journal of Solids and Structures* is dedicated by friends, colleagues and students to the memory of Charles (Chuck) Dwight Babcock, Jr, Professor of Aeronautics and Applied Mechanics at the California Institute of Technology, who died of cancer on 1 July 1987, at the age of 53.

The papers were invited and edited by an editorial committee consisting of Wolfgang Knauss, California Institute of Technology; Stelios Kyriakides, University of Texas at Austin; Josef Singer, Technion—Israel Institute of Technology; and Viggo Tvergaard, Technical University of Denmark.

The wide range of topics covered by the papers in this issue are representative of the breadth of the scientific interest of Chuck Babcock, but the papers are also related as they cover the various interacting aspects of the collapse, failure and design of structures.

#### **In Memoriam Charles Dwight Babcock, Jr**



Charles Dwight (Chuck) Babcock, Jr, was born in Indianapolis on 17 June 1934, and attended school there. He then attended Purdue University and obtained his B.S. degree in 1957. He continued with graduate studies at the California Institute of Technology where he obtained an M.S. degree in 1958 and his Ph.D. in 1962. In that year he joined the faculty of Caltech, where he was active in research and teaching till his untimely death on 1 July 1987. He was appointed Professor in 1974 and Professor of Aeronautics and Applied

Mechanics in 1982. From 1984 he also served as the Institute's highly respected Vice Provost.

Dr Babcock was one of the eminent researchers and educators in structural mechanics in the U.S.A. Though he was only in the middle of his career, his contributions to structural stability and dynamics of shells, and failure of composite structures, have greatly advanced our knowledge in these fields. He was an outstanding experimentalist who was equally proficient in theory and numerical analysis (his Ph.D. minor was mathematics), who searched for the basic phenomena while always thinking about possible practical applications. The combination of strong analytical foundations with powerful experimental techniques led to a better understanding of the problems he worked on as well as to more meaningful results. His contributions to our knowledge of the influence of imperfections on the buckling behavior of shells and to the relevant experimental techniques laid the foundations for major advances in the analysis of imperfect shells. His careful two-pronged approach to dynamic buckling of arches and shells clarified our understanding of their behavior under dynamic loading. The work on the dynamics and arrest of propagating buckles in offshore pipelines not only significantly advanced our understanding of the phenomenon but also yielded practical solutions to overcome the problem. His contribution to the understanding of damage initiation and growth in composites under compressive loading opened new avenues of thought. In plastic buckling he initiated a very careful experimental program, aimed at providing the data for more reliable plastic modeling, which data and their evaluation will form the basis for the work of many researchers in future years. With these and many other contributions that resulted from his in-depth research, Chuck Babcock stood out in the breadth of his scientific interests which were aroused very often by practical problems he encountered in industry.

Chuck was a great researcher, but at heart always first a devoted educator who gave so much to his students. This commitment was equally evident in the classroom as in his interactions with students at the research level. He imparted his desire to understand deeply and to use that understanding in practice to his many graduate students (15 Ph.D.s and 10 Engineers degrees) who were always his primary concern. His broad scientific knowledge and practical engineering sense made him also a much sought after consultant and indeed 29 industrial companies, among them the major aerospace and oil firms, benefited from his advice.

Dr Babcock was also very active in his professional communities. At Caltech he served on numerous committees and in different capacities as an officer of the faculty up to Vice Chairman, prior to his appointment as Vice Provost in 1984. He was very active in the AIAA, both in the LA Section and in the National Structures Technical Committee and SDM Program Committee and served as Associate Editor of the *AIAA Journal* from 1974 to 1977. He was also active on many committees of other Engineering Societies such as ASME, SEM (SESA) and ASEE.

In 1980–1981, on leave of absence from Caltech, he served as Section Head of the Division of Civil and Environmental Engineering at the National Science Foundation, and in 1975–1976 he was Visiting Professor of Solids Mechanics at the Technical University of Denmark.

Besides his deep commitment to the technical aspects of the engineering profession Chuck demonstrated a profound concern for the human side of its community. This concern was experienced strongly by his students who uniformly revere him; it was clearly transmitted to those working with and around him regardless of their position level in an organization. Sensitive to the personal and human needs of anyone with whom he interacted, he was a great facilitator to generate the most positive outcome in difficult situations. His infectious laughter was a continuous demonstration of his belief that every problem has a brighter side that is worth pursuing.

Chuck was always intent on improving the conditions for research in and teaching of engineering. He was fully committed to the idea and execution of service and shrank from no task, however menial it appeared, if it needed to be done. This "I'll do it" attitude made him a welcome participant in many activities locally or nationally, such as a member of the ABET visitation committee at the University level. He ably guided the Caltech/JPL

Employee's Federal Credit Union as a member of its Board for many years and later as its President.

Chuck Babcock will be remembered by his many colleagues, students and friends, not only for his great contributions but also for his charm, humor, and great human warmth.

JOSEF SINGER  
WOLFGANG G. KNAUSS