

This Week's Citation Classic

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Boley B A & Welner J H. *Theory of thermal stresses.* New York: Wiley, 1960. 586 p.
[Depts. Civil Engineering and Mechanical Engineering, Columbia Univ.,
New York, NY]

This book describes fundamental and applied aspects of the analysis of the behavior of solids and structures experiencing temperature variations. [The *SCI*[®] indicates that this book has been cited over 485 times since 1961.]

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"In the early-1950s a great deal of attention was placed on the development of nuclear energy sources and the attainment of high-speed flight. Both result in operating conditions at high temperatures, and the consequent interest in material performance under these conditions on the one hand, and in the analysis of structural behavior on the other, was very natural and lively.

"Jerry Weiner and I shared in the excitement of a field which combined the attractive characteristics of being important and relatively undeveloped. We started working on a somewhat random variety of problems, mostly under contract sponsorship of the US Air Force. The choice of problems was quite open because, in spite of its long history, the subject of thermal stresses had remained dormant until the mid-1940s. More significantly, research was indeed needed at the forefront of then current knowledge (particularly regarding inelastic material behavior), but at the same time some of the thermodynamical and mechanical foundations of the subject were not completely clear.

"We tried to fill in the gaps and to work at both levels, and it became natural to think of collecting the still developing state of knowledge in a monograph. This we did, completing in August 1955 a reasonably complete summary report.¹ From there, the

idea of 'turning it into a book' was not too long in coming; and although in retrospect the thought that this could be done in a short time was a naive one, the project assumed a life of its own. We were gradually trapped by the soundest of reasons: we were learning as we went along. The report alluded to also included an annotated bibliography² of all published work in the field, which provided an invaluable perspective. One of its entries for 1940 in particular carries a poignancy far exceeding the scope of our book, namely, a paper by Finzi-Contini, whose tragic end was chronicled in a renowned book and motion picture.

"Our answer to the question of what the level, audience, and scope of the book should be was thus stated in the book's preface: 'Parts 1 and 4 are concerned with the more theoretical aspects of the subject, whereas Parts 2 and 3 deal with a more practical approach. Although there are frequent cross references from one part of the book to another, Parts 2 and 3 are to a large extent self-contained, and require a less extensive theoretical background than Parts 1 and 4. The book is thus aimed both at the researcher and at the practicing engineer, as well as, of course, at the student; and although it is inevitable that each will find topics that are not treated to his full satisfaction, it is our hope that a useful purpose has been answered by presenting the salient features of the subject in a single source from a unified and basic theoretical point of view.' This blending of the various viewpoints is no doubt one of the principal reasons for the book's apparent success.

"Another reason is more a matter of conjecture, but has seemingly to do with the book's clarity. If so, it can only be because we wrote nothing that was not, in its final form, clearly understood by both of us. This practice led to many time-consuming and, sometimes, rather warm discussions; but in spite of these—and contrary to widespread predictions!—Jerry and I have remained good friends."

1. Boley B A & Welner J H. *Thermal stress analysis for aircraft structures. Part I. Theory and methods of analysis.* New York: Columbia University, Institute of Air Flight Structures, August 1955. AF WADC Technical Report No. 56-102.
2. Boley B A, Welner J H & Tollins I S. *Thermal stress analysis for aircraft structures. Part II. Bibliography.* New York: Columbia University, Institute of Air Flight Structures, August 1955. AF WADC Technical Report No. 56-102.