

Advances in Mathematical Modeling and Experimental Methods for Materials and Structures

SOLID MECHANICS AND ITS APPLICATIONS

Volume 168

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Aims and Scope of the Series

The fundamental questions arising in mechanics are: *Why?*, *How?*, and *How much?* The aim of this series is to provide lucid accounts written by authoritative researchers giving vision and insight in answering these questions on the subject of mechanics as it relates to solids.

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The median level of presentation is the first year graduate student. Some texts are monographs defining the current state of the field; others are accessible to final year undergraduates; but essentially the emphasis is on readability and clarity.

Rivka Gilat • Leslie Banks-Sills

Advances in Mathematical Modeling and Experimental Methods for Materials and Structures

The Jacob Aboudi Volume

 Springer

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Foreword

This volume is dedicated to Jacob Aboudi, a fine scientist who has made seminal contributions in applied mechanics. The papers presented here reflect the appreciation of many of Jacob's colleagues. A publication list following this introduction provides an indication of his distinguished academic career, currently in its fifth decade, and the breadth of his knowledge. His papers consistently demonstrate originality, innovation and diligence. This list uncovers the methodical work of a dedicated researcher whose achievements established him as a leading authority in the area of mathematical modeling of the behavior of heterogeneous materials, the area which became known as homogenization theory.

Starting in 1981, Jacob established a micromechanical model known as the Method of Cells (MOC) which evolved into the Generalized Method of Cells (GMC) that predicts the macroscopic response of composite materials as a function of the properties, volume fractions, shapes, and constitutive behavior of its constituents. The versatility of the model has been demonstrated to effectively incorporate various types of constituent material behavior (i.e., both coupled and uncoupled mechanical, thermal, electrical and magnetic effects). As a result of its potential in providing an efficient tool for the emerging field of multiscale analysis, the method gained increasing attention and became a subject for further research. In 1997, NASA presented Jacob with a certificate of recognition "for the creative development of exceptional scientific and technical contributions which have been determined to be of significant value in the advancement of the aerospace technology program of NASA entitled: MICROMECHANICAL ANALYSIS CODE with GENERALIZED METHOD of CELLS (MAC/GMC)".

Subsequently, the limited accuracy of GMC which results from neglecting coupling between normal and shear stresses led to his developing the High Fidelity



Generalized Method of Cells (HFGMC). Jacob continues to extend this method with incorporation of large deformations, constitutive laws for advanced constituent materials and an improved numerical formulation.

The publication list also reflects Jacob's contributions in other areas including wave propagation, fracture mechanics, contact problems and applied numerical solutions of partial differential equations.

Of course, the publication list cannot provide any indication of Jacob's character and interests, such as his love of history. In this regard, those who have had the pleasure to collaborate with him can attest to his integrity, collegiality, sound judgment and ability to give advice on a wide spectrum of issues. He is skilled at effectively clarifying complex concepts for students, is dedicated to his graduate students, and has contributed to the academic community in numerous ways.

Jacob Aboudi was born in 1935 in Baghdad, and emigrated to Israel in 1951. After graduating in 1961 with a B.Sc. degree in Applied Mathematics from Tel Aviv University, Jacob taught in the same department while pursuing advanced studies at the Weizmann Institute of Science. The latter institution awarded him M.Sc. and Ph.D degrees in 1964 and 1968, respectively, both in Applied Mathematics. Jacob was then hired as a Lecturer at Tel Aviv University, first in the Department of Environmental Sciences and then in the Faculty of Engineering where he became a Professor in 1980. He served 8 years as the head of the Department of Solid Mechanics, Materials and Structures, 6 years as the Dean of the Faculty of Engineering and participated in many University and Faculty Committees. Jacob was the incumbent of the Diane and Arthur Belfer Chair of Mechanics and Biomechanics for 13 years.

Jacob has spent sabbatical leaves and extended visits abroad at the University of Strathclyde, UK, Northwestern University, Virginia Polytechnic Institute and State University, the University of Virginia, and at NASA Glenn Research Center, Cleveland, all in the USA.

With this volume, we wish to express our profound respect and admiration of Jacob Aboudi.

Rivka Gilat and Leslie Banks-Sills

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