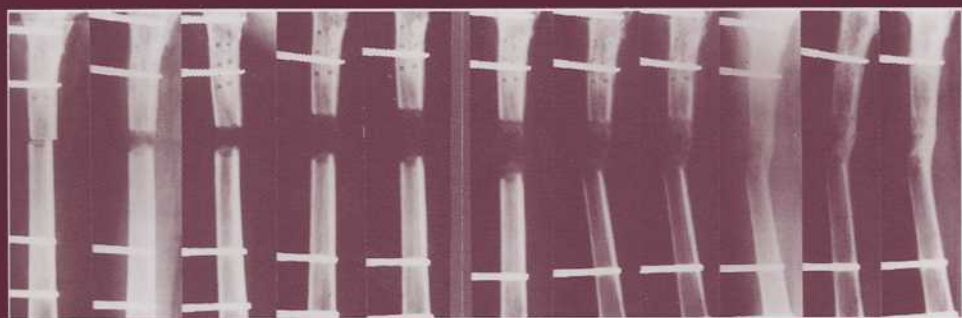
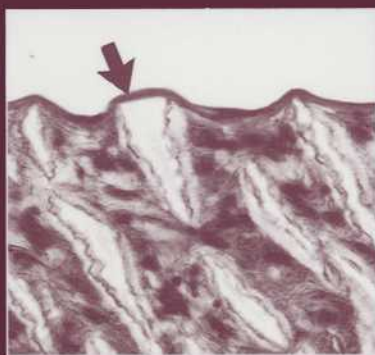


# BIOMATERIALS' MECHANICAL PROPERTIES



**KAMBIC/YOKOBORI**

E D I T O R S



**STP 1173**

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# ***Biomaterials' Mechanical Properties***

*Helen E. Kambic and A. Toshimitsu Yokobori, Jr., Editors*

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The quality of the papers in this publication reflects not only the obvious efforts of the authors and the technical editor(s), but also the work of these peer reviewers. The ASTM Committee on Publications acknowledges with appreciation their dedication and contribution to time and effort on behalf of ASTM.

# Foreword

Biomaterials science has attained great importance, particularly in the last two decades with the introduction of polyurethanes, metal components, novel plastics, coatings, and more recently with the advent of bioresorbable materials. Although there are hundreds of potential choices of materials and synthetic materials, each remains distinct with regard to their synthesis, additives, bulk and surface properties. As soon as the methods for production were formalized, engineers began testing them and clinicians were eager to implant them—but not necessarily in that order. Processing into prosthetic devices profoundly changed the mechanical properties and their implant behavior. Therefore, the search for the right combination of these properties continues.

## ASTM

This publication, *Biomaterials' Mechanical Properties*, contains papers presented at the symposium of the same name, held in Pittsburgh, PA on 5–6 May 1992. The symposium was sponsored by ASTM Committee F-4 on Medical and Surgical Materials and Devices and its Subcommittee F4.04 on Cardiovascular Implants and Materials. Helen E. Kambic, from The Cleveland Clinic Foundation, and A. Toshimitsu Yokobori, Jr., from Tohoku University, Japan, presided as symposium co-chairs and are co-editors of the resulting publication.

The specific aims of the symposium were (1) to review our current test methods, (2) to identify new testing techniques, and (3) to promote an interchange between manufacturers, basic scientists and clinicians. To promote these aims, several prominent scientists from industry and academia were invited to present papers in each of the sessions. The international flavor of the meeting was spearheaded by Dr. T. Yokobori, Professor and Dean, School of Science and Engineering at Teikyo University, Utsonomiya, Japan.

The technical sessions focused on testing methods that emphasized an understanding of material properties and exploiting this knowledge to serve as an experimental database for future analysis and design.

The Session Chairs were M. Saitoh (Sendai, Japan), P. Marlowe (FDA, USA), J. Lee (Toronto, Canada), R. Benson (Knoxville, TN), Y. Miyasaha (Sendai, Japan), S. Teoh (Singapore), S. Niwa (Aichi, Japan), S. Brown (Cleveland, OH), K. Hayashi (Sapporo, Japan), Y. Tanabe (Nigata, Japan), H. Watanabe (Kyoto, Japan), M. Nakamura (Osaka, Japan), S. Niwa (Aichi, Japan), H. Kambic (Cleveland, OH), A. T. Yokobori (Sendai, Japan), and T. Yokobori (Utsonomiya, Japan).

The first Student Prize Competition was introduced at this meeting. A stipend and plaque were presented to the winning student paper based on the theme of the symposium. The student presentation was given in the technical session. The concept of the competition was inaugurated by D. Marlowe (FDA–Rockville, MD), J. Black (Clemson, SC), R. Hori (Zimmer, Inc.—Warsaw, IN), M. Mayor (Darmouth, NH), and K. St. John (Jackson, MS).

A workshop was held at the end of the formal presentations, and mathematical modeling, government and academic sponsorship of research, testing protocols, biostatistics, product-oriented research, and quality assurance issues were debated.

We would like to express our thanks to several people: D. Savini (ASTM) for her suggestions throughout the symposium planning process; T. Pravitz and K. Dernoga (ASTM) for manuscript submissions and publications; and our numerous reviewers, to whom we are enormously indebted.

### *The Editors*

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