

# Clinical Applications of Biomaterials

Edited by  
**A.J.C.LEE**  
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# *Clinical Applications of Biomaterials*

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## REFEREES

The Editors wish to acknowledge, with thanks, the work and dedication of the co-editors who undertook the task of refereeing all the submitted papers.

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## SERIES PREFACE

Biomaterials is that branch of biomedical engineering that is concerned with the materials aspects of medical devices. Any material, metal, ceramic, plastics or organic, brought into contact with the fluids, cells, and tissues of the living body comes within the domain of biomaterials science. Included are surgical implant and dental materials, dressings, orthotics, prosthetics materials, and those used in extracorporeal circulation devices. Biomaterials scientists are concerned with the physical and chemical properties of materials and their suitability for a particular device. They are concerned how these properties are altered by the biological environment and how the materials may affect the body. The subject spans the physical and life sciences.

Biomaterials science has expanded rapidly in the last few years, nurtured by enthusiasts in the medical profession, in universities, commerce, and government agencies. Many universities now offer undergraduate and post-graduate teaching courses. Among the societies that exist to promote the safe and efficient use of biomaterials and to encourage the development of a sound rational basis for this discipline are: the Society for Biomaterials (U.S.A.) founded in 1974, the Biological Engineering Society (U.K.) founded in 1960 and which established a specialist topic group in biomaterials in 1974, and the European Society for Biomaterials founded in 1976. Japanese and Canadian societies were inaugurated in 1979. These societies play a major part in the development of our subject by organizing international meetings which provide a forum for the exchange of ideas in clinical and basic research. Special mention should be made of the International Biomaterials Symposia inaugurated at Clemson University, South Carolina, in 1979. This series of annual meetings, sponsored by the Society for Biomaterials (U.S.A.), is held in high esteem by the biomaterials fraternity. Other regular conferences are the series entitled "Materials for Use in Medicine and Biology", organized by the Biological Engineering Society (U.K.), the Gordon Conferences on Biomaterials, and the European International Conferences. The 1st World Biomaterials Congress was held in Austria in the Spring of 1980 and the proceedings are published in this series. Many other meetings having a biomaterials content are held each year, such as the Annual Conference on Engineering in Medicine and Biology, and meetings organized by associations of biomechanics, artificial organs, orthopaedics, dentistry, cardiovascular surgery, plastic and reconstructive surgery, etc.

It was to complement the valuable activities of these societies that the idea for this series on "Advances in Biomaterials" was born. It is intended to provide a vehicle for the publication of the proceedings of meetings on biomaterials which will grow into a valuable reference library. Volumes dealing with special topics may be commissioned as appropriate. It is inevitable that in an interdisciplinary field such as this data are rather widely

scattered in the literature. The series will fulfill its purpose if it succeeds in building a coherent body of knowledge for the use of students and practitioners in biomaterials, for the ultimate benefit of patients.

Dec. 1981.

A. J. C. Lee.

## VOLUME PREFACE

The study of biomaterials can be carried out at many levels, from a pure material characterisation in a laboratory environment, to a long term study of how a material behaves when in use in a patient. It is a fact that most clinicians only become interested in biomaterials when they reach the latter stage, that of being used in a patient. When this stage is reached, it is the interface between the material and the patient that has to be studied and understood by both the bioengineer and the clinician. It was with this fact in mind that the recent conference on interactions between materials and tissues in orthopaedic, maxillofacial, dental and plastic surgery was held in Gothenburg, Sweden. The aim of the meeting was to review the current status, and to promote a better understanding, of the interface between biomaterial and tissue in all these areas. Papers were presented by clinicians and engineers. Consequently, a wide variety of approaches to the interface problem was given, but all had the common denominator of clinical relevance, there was very little of the "pure research" from ivory tower laboratories to be found. The papers in this volume are based on those presented at the conference and submitted to the editors for publication. They have all been refereed by experts in the particular fields of biomaterials. Forty eight papers were submitted for publication and thirty nine accepted.

The volume is divided into four sections. The first section presents papers relevant to the field of orthopaedics and ranges from studies of ligaments and tendons, to studies of bone cements used to locate implants. The second part deals with dental implants and includes an impressive collection of papers relating to the titanium osseointegrated implants developed in Gothenburg, as well as other papers relevant to this area of work. If a biomaterial is to function properly then its chemical and biological reactions with the host must be understood. The chemical interactions section of the book considers various aspects of corrosion and biodegradation as applied to metal and ceramic implants and implant materials. The final section on biological interfaces covers a wide range of biomaterials, from natural materials such as collagen to the man made plastics and metals, and concludes with two papers on the problems of wound dressings and control of infection. The editors hope that the work presented in this volume will be read by clinicians and bioengineers, and help to foster the continuing cooperation between the two groups of workers.

It would be wrong to conclude this volume preface without mentioning two particular colleagues of us all. Jean Leray was President of the European Society for Biomaterials up to the time of his death. He was one of the initiators of the Gothenburg conference, and was a very active member of the executive committee which planned the conference and ensured its success. George Winter, a former President of the European Society for Biomaterials, had been selected as Editor of these Conference Proceedings, and he had been working with the Publishers on the Advances in Biomaterials series up to the time of his death. The loss of these two men of science is a great blow to us all, and our sympathy, and thanks,

are extended to their families and friends.

Finally, the editors wish to express their thanks to the panel of referees, whose names are recorded elsewhere in this book, for the excellent way in which the submitted papers were dealt with. If this volume is a success, it will be due to their efforts as well as ours.

A. J. C. Lee

December 1981.

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