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Orthopaedic Biomechanics

AMAS Workshop – OBM'02
Wrocław, September 1-4, 2002

edited by

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Centre of Excellence
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Foreword

This comprehensive volume contains selected papers presented during the Workshop "Orthopaedic Biomechanics" organized within the framework of the 13th ESB[1)] Conference, September 1-4, 2002, Wrosław, Poland. The Workshop constituted a part of activities of the Centre of Excellence for Advanced Materials and Structures (AMAS). The final form of the volume and its production was also supported by the Centre of Excellence ABIOMED (Applied Biomedical Modelling and Diagnostics).

The volume consists of two parts. The first part includes five general lectures whilst the second part presents seven largely extended contributed papers.

The topics covered by the volume are numerous and range from fundamental aspects of constitutive modelling of bone behaviour and bone remodelling to clinical aspects of orthopaedic biomechanics.

M. A. Adams reviewed current trends in back pain research and suggested how biomechanics can fit in, despite tendencies in favour of research into psycho-social behaviour and genetic inheritance. In the second paper, by G. Bergmann, F. Graichen and A. Rohlmann, the authors summarized their most important results on the contact forces acting at the hip joint during various everyday activities. Next, S. C. Cowin reviewed some of the background research on mechanosensory mechanisms responsible for bone remodelling and outlined candidates for the mechanosensory system. The similarities of the mechanotransduction system used by the hearing organs were described. The aim of the paper by G. H. Duda and M. O. W. Heller was to investigate muscles and bones as interacting structures. R. Ruimerman and R. Huiskes reviewed the work directed by the second author during the last 15 years, concerning prediction of bone adaptation to external loads from a macroscopic level towards a cell-based level.

R. Będziński presented experimental techniques used in engineering biomechanics. The paper by D. Jasińska-Choromańska, D. Kołodziej and J. J. Telega presents a concise historical overview of external fixators including those allowing for dynamisation. Models of bone fracture healing are also discussed. Application of homogenisation methods to micro-macro modelling of com-

[1)] ESB – European Society of Biomechanics

pact and cancellous bone is synthesized in the paper by J. J. Telega, A. Gałka, B. Gambin and S. Tokarzewski. The paper by S. Jemioło and J. J. Telega is concerned with an insightful presentation of various approaches to using fabric tensors in bone mechanics. A model of simultaneous internal and external remodelling of bone was proposed by J. Piekarski and E. Tanaka. The aim of the paper by M. Stańczyk and J. J. Telega was to review thermal problems specific to orthopaedics. The last comprehensive paper by J. J. Telega and R. Wojnar synthesizes various viewpoints and contributions to streaming potentials and related phenomena in biological tissues, mainly animal.

All in all, the volume covers many currently important topics in bone and orthopaedic biomechanics. Some views of the authors of the papers may seem to be rather speculative and require further development including experimental testing and clinical approval. The Editor does really hope that the volume will be useful both for Ph.D. students and biomechanists.

The Editor of the volume is grateful to the organizing Committee of the 13th ESB Conference, and particularly to its chairman, Professor Romuald Będziński. Organizational efforts of Dr. Tomasz Lekszycki are also greatly appreciated. Last but not least, careful typesetting work of T. G. Zieliński and M. Stańczyk should also be mentioned.

J. Joachim Telega
Chairman of the Workshop

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