

**MARTIN LUTHER UNIVERSITY
HALLE-WITTENBERG**



**MICRO- AND NANOSTRUCTURES
OF BIOLOGICAL SYSTEMS**

Selected Proceedings of the 3rd Symposium
held at the Martin Luther University Halle-Wittenberg

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Micro- and Nanostructures of Biological Systems

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PREFACE

Dear Reader, dear Scientist.

The symposium “ Micro-and Nanostructures of Biological Systems” has taken place in this year for the third time at the Martin-Luther University Halle-Wittenberg, the eldest and most important education institution in our state Saxony-Anhalt. The university was first founded 1502 in Wittenberg. 1694 opened the Prussian sovereign Frederick III the university faculties in Halle (Saale). In this academic year more than 18 000 students are registered and study in more than 100 courses.

The university contains in their faculties every important scientific disciplines, as mathematics, chemistry, physics, biology, the engineering and the material science as well as pharmacy and medicine in a close distance. All of the designated are involved with the determination of structures in the micro and nano range. Apart from this scientific capacity at the university, in Halle the Fraunhofer Institute for Mechanics of Materials and the Max-Planck- Institute for Microstructure Physics are dealing with similar topics, too.

That’s why it has been a great pleasure for us to be the host also for the third interdisciplinary symposium in “Micro-and Nanostructures of Biological Systems. This event has taken place under the patronage of the European Society for Engineering and Medicine and the president of this society, Professor T. C. Lee from Ireland opened in June 2004 the symposium and participates in the present issue, too. In good continuation to the former symposia, about 70 scientists from different European countries came to present their results, listened to 21 lectures and paid attention to several poster presentations in the scope to exchange the experiences in research in a broad interdisciplinary field.

In the present booklet, the main focus of selected papers is dealing with structures and modulation of human hard tissues as well as about structural information obtained by atomic force microscopy. By nine selected papers will presented and discussed recent results. Seven of them deals on the broad topic of bone research, determining the mechanical properties and simulate them within computer calculation and three-dimensional modelling.

PD. Dr. Hans-Joachim Hein, one of the organizers of the symposium series "Micro- and Nanostructures of Biological Systems" investigated this research area from just after the finish of his degree in physics in the year 1966, and worked all the years at the Martin Luther University. At present, he retired and celebrated his 65th birthday with many international guests from Ireland, Great Britain, Latvia, Austria, Russia, Belgium, Switzerland and Germany during the symposium. I want to wish him all the best for his upcoming life, and know that he will still stay in his office on the coming time, as possible, and the university can participate on his knowledge.

I want to take this occasion to invite you to take part in the next meeting at our University in 2006. Good bye.

Prof. Dr. Wilfried Grecksch
Rector of the Martin Luther University Halle-Wittenberg

Symposium in Honour of Hans-Joachim Hein on his 65th Birthday

The present event would not have been taken place without the encouraged support of the European Society for Engineering and Medicine (ESEM), and we greatly appreciate their

help. Today, we have to congratulate one of their council members Docent Hans-Joachim Hein on his 65th anniversary and regret his retirement.

He has been a major driving force in shaping the interdisciplinary research on biomechanics at the Martin Luther University Halle-Wittenberg, in a very good cooperation with other faculties far-beyond the department of medicine. His dedication towards our university covers many aspects, from teaching physical and medical students to supervising the academic offspring and training unemployed scientist to open their vocational adaptation. Numerous scientists have by now directly gained experience and expertise and are spread all over the world.

His research found international recognition in cooperations with the universities of Gdansk (Poland), Pisa (Italy), Wisconsin (USA), Cleveland (USA), and last but not least with Riga (Latvia), as well as several German universities, like Bremen and Munich. We, as his colleagues, enjoy the reliable, cooperative and dedicated interaction with him, which is far beyond a simple business relationship. As a result of his scientific passion, bone structure research has by now become synonymous with the RG Biomechanics and Structure Research, Halle(Saale)/Germany. In addition to his scientific impact, his support of science in various social and political



functions as an advisor in the European Society of Engineering and Medicine, is highly acknowledged.

My first personnel contact was in 1996 with AFM investigations. We started a fruitful cooperation, whereby my research focus was on the study of DNA-ligandation and living cell analysis. This seems very far away from bone structures and biomechanics. However, in October 2003, we published with Bernstein and Wohlrab a chapter in the textbook of the series *Methods in Molecular Biology, Atomic Force Microscopy - Biomedical Methods and Applications*¹.



The aim of the symposium and book series “Micro- and Nanostructure of Biological Systems” is the communication of significant research from all fields of biological and medical structural functions. Almost five years ago, Hans-Joachim Hein and I established this interdisciplinary symposium, since we sensed a strong need for a discussion podium in the above topic of structural

research. Several techniques can be used to investigate biological systems, which all have their benefits and disadvantages. The obtained information is rather complex, and often difficult to equalize and validate with other methods. On this motive, we installed the sections “Analysis of Cell Fine Surface Structures”, “Innovative Technologies”, and “Applications in Bioanalysis” into this symposium and repeated it in biennial time-interval, following by an

¹ Eds. P.C. Braga, D. Ricci, Vol. 242, Humana Press USA, ISBN 1-58829-094-8, pp. 105-124.

extended conference issue in the year between. Always, the symposium series tries to give a discussion panel, since many scientific problems can only be solved with interdisciplinary knowledge. Hans-Joachim Hein initiated that the symposium series is uncharged for student.

We would like to thank all speakers for their interesting talks. The time consuming preparation of these events are provided without monetary reward and are highly appreciated. We also appreciate very much the assistance of students in the conference office, as well as Professor A. Blume, dean of the department of chemistry, for his support in organizing the event.

Have a good time, Hans-Joachim Hein, from all colleagues and the symposium organizing team.



Gerlinde Bischoff

Pictures are done by W. Reinboldt, PD Dr. E. Haberland and R. Bischoff. They display: I. the birthday party of Hans-Joachim Hein, June 7th 2004, with friends and colleagues, II. the symposium opening by the president of the ESEM, Prof. Lee, and III. members of the organizing team G. Bischoff and H.-J. Hein.

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