

EUROMECH Colloquium 585

“Advanced experimental methods in tissue biomechanics”

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Accurate mechanical characterisation of soft biological tissues and the identification of suitable material models is of high interest, not only for fundamental research, but also in many fields of life sciences and medicine. One major problem concerns the measurement of these properties without damaging the surrounding tissue or applying highly invasive techniques. Inverse numerical methods, where classical forward finite element analyses are iteratively tuned so that they fit the experimental outcome are one possibility to address this problem and provided a focus for the previous Colloquium 534, held five years ago. However, a large number of remaining and new open questions are still to be answered, when identifying mechanical characteristics or material parameters from experiments on biological tissues.

The aim of EUROMECH Colloquium 585 was therefore to capture the advances in this field, with a particularly focus on new types of experiments and measurement set-ups, and their combination with computational methods. This goal was clearly achieved: A variety of novel and promising experimental techniques were presented that combine classical mechanical characterisation with advanced microscopy techniques, bioreactor set-ups, dedicated loading protocols that provide different physical, chemical or biological cues, and computational tools to control the systems and analyse the results. Advanced modelling and simulation approaches to interpret the experimental outcome were proposed, bridging the different scales from the nano- though micro- to the macro-level.

Colloquium 585 brought together experts from experimental, theoretical, biomedical, and clinical research focusing on experimental soft tissue biomechanics, and young scientists from all related areas. To support the participation of early stage researchers, three grants were awarded, including the regular conference fee, hotel costs, and all meals. Both questions related to fundamental research, as well as aspects related to medical applications were addressed during the colloquium.

The scientific programme for Colloquium 585 included 46 oral presentations. These highlighted various experimental methods in biomechanics ranging from experiments on cells and single fibres through passive soft tissue and active muscle mechanics to methods used to identify mechanical characteristics of whole organs. All contributions were followed by an intensive and constructive discussion. Further, five of the presentations were provided as keynote lectures given by international experts which provided overviews on recent advances in five focused areas.

During the colloquium, a mutual understanding of current problems and possible solutions was developed, despite the different areas of expertise of the participants. This was facilitated by the relatively small number of participants and by the colloquium venue, the medieval castle Burg Warberg, which hosted all participants. This allowed an intensive scientific exchange during the talks but also during coffee, lunch, and dinner breaks.

The scientific results presented at the colloquium were consistently of very high quality and will partly be published in a peer reviewed special issue of the Journal of the Mechanical Behaviour of Biomedical Materials. The feedback received from the participants was throughout very positive. The organisers and participants are very thankful to EUROMECH for their support, which made this outstanding scientific meeting possible.