

COMBINING HIGH-RESOLUTION BONE AND JOINT IMAGING WITH GAIT ANALYSIS: CROSSING BOUNDARIES IN BIOMECHANICS

Egon Perilli

Medical Device Research Institute, College of Science & Engineering, Flinders University, Adelaide, Australia

Background

It happens too often that when we try to combine the best of two worlds we hit a wall: experts (and geeks..) in one discipline cannot (and refuse to) understand the other.

Biologists are not really used (or don't really want) to hear about force, stress and strain; mechanical engineers usually not about cellular biology and gene expression. OK, not new.

Recent Advances

However, when we then try looking within biomechanics [1], even high resolution imaging [2], bone histomorphometry [3, 4] and gait analysis [4, 5] (Figure 1), seem to be very different churches.

The real boundary is too often between sub-disciplines, wanting to understand in depth the own sub-discipline but not trying to enter the other.

So to communicate your findings, either you submit to a scientific journal of one sub-discipline eliminating the details of the other sub-discipline -but then that will not be read by the others -or you submit to a more cross-boundary journal, getting 50% happy and 50% unhappy reviewers (experts in one but not the other).

Where is the real advance?

Future directions

For the quick output, the choice is certainly the geeky sub-discipline journal; whereas for the long term, informing a wider audience and possibly providing a real advance to the biomechanics and broader community, the choice is probably in the more difficult and courageous cross-boundary publication.

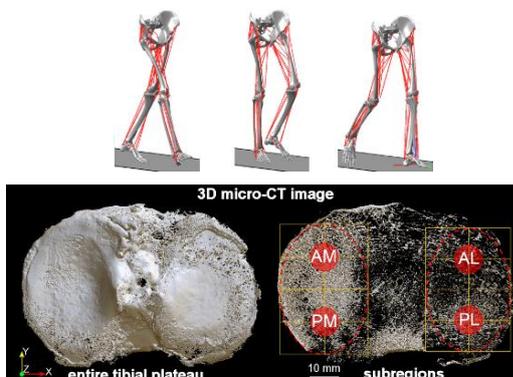


Figure 1: Top: Musculoskeletal model of lower limb and pelvis used to calculate knee joint contact forces during stance phase. Bottom, left: 3D micro-CT image of a right tibial plateau, top view (17 $\mu\text{m}/\text{pixel}$). Right: Micro-CT cross-section image of subchondral bone.

Egon Perilli, currently Senior Lecturer, at Medical Device Research Institute, College of Science & Engineering, Flinders University, Adelaide, Australia, obtained his PhD in Bioengineering (2006), at the University of Bologna, Italy, doing his research at the Rizzoli Institute (Bologna). In 2007 he was a post-doctoral fellow, at University of Antwerp (Visionlab), Belgium and 2008-2011 at the Institute of Medical & Veterinary Science, Adelaide, Australia. He is the current President of the Australian & New Zealand Orthopaedic Research Society (ANZORS), board member of the International Federation of Musculoskeletal Research Societies (IFMRS), member of ESB, ISB, ANZSB, ANZBMS. His present research and collaborations focus on 3D quantitative imaging, mainly micro-CT, of bone structures combined with biomechanical testing and *in vivo* gait analysis, in osteoporosis and osteoarthritis. He authored 45 publications in peer-reviewed journals, book chapters and over 60 presentations to international and national meetings.

References

1. Taylor et al., J Biomech, 55:121-127, 2017
2. Martelli, Perilli, J Mech Behav Biomed Mater, 84:265-272, 2018
3. Roberts et al. J Orthop Res, 35:1927-1941, 2017
4. Roberts et al., Osteoarthritis Cartilage, 26:547-556, 2018
5. Roberts et al., Osteoarthritis Cartilage, 25:1623-1632, 2017

Acknowledgements

Special thanks to Dominic Thewlis, Bryant C Roberts, Mark Taylor, Bogdan Solomon and all the enlightened scientist ranging from biomechanics experts in imaging, biomechanical testing and computational modelling to surgeons and endocrinologists, with whom we are trying to cross these boundaries.

