



## Mechanical Engineering Seminar

Monday, March, 31<sup>st</sup>, 2025 at 14:30, D. Dan and Betty Kahn Building, Room 217

### Advancing Orthopaedic-and Dental-Implant Technology and Clinical Outcomes through Biomechanical Computational Modelling and Experimental Testing

Ran S Sopher, Ph.D.

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**Hosted by: Prof. Alon Wolf**

Dr. Sopher will present his research on improving orthopaedic and dental implant technology. His work focuses on integrating biomechanical computational modelling and experimental testing to enhance the clinical outcomes of joint arthroplasty.

In his past research, Dr. Sopher has delved into the intricate architecture of muscles acting over the ankle and their functional roles. He utilised musculoskeletal modelling to estimate muscle reaction loads in the talocrural joint and explored the design and positioning of ankle-replacement implants to improve fixation and reduce loosening. Additionally, he studied the effect of extracellular matrix (ECM) architecture and mechanical properties on intercellular mechanical signalling, developing computational models to understand how cells communicate through mechanical pathways.

Currently, Dr. Sopher is focused on the development and optimisation of 3D-printed bone scaffolds. He conducts both *in vitro* and *in silico* mechanical tests to improve the mechanical properties and performance of these scaffolds, aiming to enhance their integration and functionality. He is also involved in the development of a total-knee-replacement implant allowing deep knee flexion.

Looking ahead, Dr. Sopher plans to combine cadaveric and computational models to optimise implant design and positioning, with the goal of improving the fixation and performance of orthopaedic implants. He will utilise validated computational models to refine implant designs, enhancing their structural integrity, load-bearing capacity, and osteogenesis potential. Furthermore, he will explore bone growth and integration in both *in vitro* and *in vivo* models, investigating the correlation between mechanical loads and patterns of bone formation.

Dr. Sopher's approach aims to bridge the gap between engineering and clinical practice, ultimately improving patient outcomes in orthopaedics and dentistry.

Dr. Ran S Sopher is a researcher and lecturer in Biomedical Engineering, specialising in Biomechanics. He holds a Ph.D. from Imperial College London and M.Sc. and B.Sc. degrees from Tel-Aviv University. Currently, he is a Research Associate at the Triangle R&D Center, a Visiting Scholar at Imperial College London, and an Adjunct Lecturer at Tel-Aviv University. Dr. Sopher has extensive research experience in biomechanics and has published numerous articles in the field. He also teaches at Tel-Aviv University.

