DEPARTMENT OF MECHANICAL ENGINEERING

SEMINAR

_to be held on Thursday, April 24, 2014, 11:00_

_in the Seminar Room (#117) of the Mechanical Engineering Building (#55)_

_at the Campus of the Ben-Gurion University of the Negev_

Wavelet Analysis of Microscale Strains

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Abstract:

Recent experiments and numerical simulations provide numerous observations on the microstructure and deformation of polycrystals. These show how confined bands of deformation percolate in a complex way across various grains. Such information is represented as samples on grids, and, in turn, creates huge data sets. The extensive size of data in this form renders identifying key features difficult, and the cost of digital storage expensive. To represent, analyze, and predict strain fields with localized features, we use wavelets: multiresolution functions, which are localized both in frequency and real domains. By way of example, we focus on pseudo-elastic polycrystals, capable of recovering strains beyond an apparent elastic limit. I will show how wavelets efficiently represent experimental and simulated strains of Ni-Ti, while reducing data size by two orders of magnitude. More importantly, I will show how the compact wavelet representation captures the essential physics within. Finally, I will discuss how to use insights gained to improve specific experimental and computational methods.

Bio: Dr. Gal Shmuel graduated at the department of mechanical engineering, Ben-Gurion University (B.Sc. Summa cum Laude, 2008; M.Sc. Magna cum Laude, 2009, Ph.D., 2012). He is currently a postdoctoral scholar at the California Institute of Technology. Dr. Shmuel explored strain hardening in soft tissues and rubber, wave propagation and tunability of electroelastic composites, and currently phase transformation in polycrystals. His goal is to promote engineering of new metamaterials with enhanced properties and functionalities at the macroscopic scale, by a thorough understanding of their multi-physics at the micro-scale.