The Iby and Aladar Fleischman
Faculty of Engineering
Department of Materials Science and Engineering

אוניברסיטת תל-אביב
TEL AVIV UNIVERSITY

הפקולטה להנדסה
ע"ש איבי ואלדר פליישמן
המחלקה למדע והנדסה של חומרים

You are cordially invited to attend this seminar to be held on

Wednesday, January 13th, 16:00
Room 103, Engineering Class (Kitot) Building

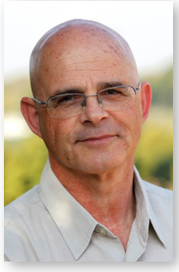
Inspirational multiscale biological structures

Prof. H. Daniel Wagner
Department of Materials & Interfaces, Weizmann Institute of Science, Rehovot

The biological world is replete with composite structures of various kinds, which could be teaching us important lessons in terms of assemblies sophistication and ensuing mechanical property optimization. For example, in nature high toughness is generally provided by means of multiscale (from nano to macro) fibrous composites, rather than with composite structures at a single scale. This will be illustrated by means of examples taken from our recent research with synthetic layered structures based on the turtle carapace [1,2], sponge spicules [3], and tendon-like multiscale unidirectional structures [4-7].

1. B. Achrai, B. Bar-On, H.D. Wagner, "Biological armors under impact - Effect of keratin coating and synthetic bio-inspired analogues", Bioinspiration & Biomimetics, 10 (2015) 016009.
2. B. Achrai, H. Daniel Wagner, "The red-eared slider turtle carapace under fatigue loading: the effect of rib-suture arrangement", Materials Science and Engineering C 53 (2015), 128–133.
3. K. Livanov, H Jelitto, K. Schulte, G.A. Schneider, H.D. Wagner, "Tough Al2O3/polymer layered composites with high ceramic content", Journal of the American Ceramic Society 98(4) (2015), 1285-1291.
4. B. Bar-On, H.D. Wagner, "Structural motifs and elastic properties of hierarchical biological tissues - A review", Journal of Structural Biology 183 (2013), 149–164.
5. I. Greenfeld, H.D. Wagner, "Nanocomposite toughness, strength and stiffness - the role of filler geometry", Nanocomposites 1 (2015), 3-17.
6. X.-M. Sui, I. Greenfeld, H. Cohen, X.H. Zhang, Q.W. Li, H.D. Wagner, "Multilevel composite using carbon nanotube fibers", Submitted (2015).
7. H.D. Wagner, P. Ajayan, K. Schulte, "Nanocomposite toughness from a pull-out mechanism", Composites Science and Technology 83 (2013), 27-31.

Biosketch



H. Daniel Wagner is the Livio Norzi Professor of Materials Science in the Department of Materials and Interfaces at the Weizmann Institute of Science in Rehovot, Israel. Born in Israel, Prof. Wagner grew up in Belgium where he earned a Licence in Physics from the Free University of Brussels (1975). He was awarded MSc (1977) and PhD (1983) degrees in Materials Science from the Hebrew University of Jerusalem. He spent three years at Cornell University as a postdoctoral associate and lecturer before joining the Weizmann Institute's Department of Materials Research (now the Department of Materials and Interfaces) in 1986.

The author of over 250 papers and several chapters in books, his current scientific interests include the micromechanics of advanced composites and their interfaces, novel man-made materials such as carbon nanotubes and nanocomposites, and the mechanics of natural and nature-inspired structures. He was a visiting professor at the Max Planck Institute in Golm-Potsdam and at the Ecole Centrale in Paris. In 2000 he was the elected Chairman of the Gordon Research Conference on Composites in Ventura, California, and in 2013 he was invited to present the Harvard-MIT Joint Nanomaterials Special Lecture at the Massachusetts Institute of Technology. Recently he was the Chairman of the COMPO2014 Nanocomposites and Biocomposites conference at the Weizmann Institute. He is the recipient of a number of prizes and awards, among them the 2010 Gutwirth Research Prize (Israel), the 2014 Christoffel Plantin Prize (Belgium), and the 2014 Landau Prize in Chemical and Materials Engineering (Israel).