



סמינריון

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות שתתקיים ביום הי 26.12.2019 (כייח בכסלו, תשייפ), בניין דן קאהן, אודיטוריום 1, 3:45.

מרצה: יוליה מרום

מנחה: פרופי דורון שילה

מנחה שותף: פרופי/אמריי אליעזר שלו

:על הנושא

Irreversible physio-mechanical processes and collagen rearrangements in stretched fetal membranes

The seminar will be given in Hebrew

תקציר ההרצאה:

We study irreversible processes in live human amnions subjected to inflation tests that simulate the mechanical conditions prior to labor contractions. Experimental results reveal an irreversible mechanical behavior that appears during loading. Surprisingly, this behavior demonstrates a linear stress-strain relation.

A new model is introduced for the mechanical response of collagen tissues, which accounts for the irreversible deformation and provides predictions in agreement with our experimental results. Fittings of calculated and measured stress-strain curves reveal a well-defined single-value property of collagenous tissues, which is related to the threshold strain for irreversible transformation.

Second harmonic generation reveal an unexpected collagen rearrangement in the compact layer of the amnion that is responsible for the structural integrity of the fetal membrane. The observed bundling and alignment of collagen fibers indicate on a deviation from the expected equibiaxial stress state at the center of membranes. Statistical analysis of fiber orientations provides information on two driving forces for collagen alignment: micro-scale flaws and macroscale deviation from equibiaxial strain. As the pressure increases, the macroscale effect becomes dominant and high density of fibers that are align along a specific direction is observed.

A model that explains these observations and relates them to material properties is presented. The results of this study indicate that a temporal increase in the intra-uterine pressure or in the cervix opening causes irreversible changes in collagen molecular connections that may lead to critical biological changes, e.g., initiation of a premature labor.

בברכה,