



# Karlstad Applied Analysis Seminar (2022)

(Joint seminar with Research Seminars in Physics )

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## **Multiscale investigation of the structure-property relationships in the myocardium**

### **Abstract**

The myocardium is a complex tissue, primarily made of cardiac cells and extra-cellular collagenous matrix, arranged in a hierarchical microstructure. This microstructure gives the tissue its intricate mechanical properties underlying its behavior and function.

We investigated the relationship between the structure and the passive macroscopic mechanical properties of the cardiac tissue. We first observed the anisotropy of the myocardium, and developed a multiscale model to study its structural origin. We designed microstructures made of different configurations of cardiomyocytes and extra-cellular matrix, and computed their homogenized mechanical properties using numerical periodic homogenization. We then compared the anisotropic material behavior induced by these structures to available experimental data. We also developed an experimental setup, combining a full-field Mueller polarimetric imager and an in-situ traction device, to measure the local microstructural deformations during sample stretch.