Seminario HUBERT MENNICKENT *de Matemática Aplicada*

"Creando y difundiendo Matemática y sus Aplicaciones"

Expositor:

Ricardo Ruiz Baier

Mathematical Institute, University of Oxford, England

Título de la Charla:

Coupling mechanics and diffusion through stress: Modelling, numerical methods, and (only some) analysis

Fecha y Hora:
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Lugar:
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Universidad de Concepción

Resumen:

In this talk we introduce a family of mathematical models for the simulation of the active contraction of cardiac tissue using stress-assisted conductivity as a mechanism for mechanoelectrical feedback. The specific structure of the governing equations (written in terms of stress, displacements, electric potential, activation generation, and ionic variables) suggests to cast the problem in mixed-primal form. We explore the properties of the model, together with the importance of coupling variables, by means of a few computational experiments. These results suggest that stress-assisted conductivity induces an additional degree of heterogeneity and anisotropy in the propagation of the transmembrane potential, it produces conduction velocity modifications and spiral wave drifting. We also state and briefly discuss a reduced model that keeps the coupling character of the original system, but that simplifies substantially the solvability and numerical analysis. It consists of linear elasticity nonlinearly coupled with scalar diffusion in the steady regime. We finally address some extensions and current challenges.

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DEPARTAMENTO DE MATEMÁTICA Y FÍSICA APLICADAS
Universidad Católica de la Santísima Concepción

Informaciones: ggatica@ci2ma.udec.cl / jecamano@ucsc.cl / lgatica@ucsc.cl