# Seminario de Análisis Numérico y Modelación Matemática

**Departamento de Matemática, UBB**
**Centro de Investigación en Ingeniería Matemática (CI$^2$MA), UDEC**

*Expositor:*


## *Stefan Diehl*

*Center for Mathematical Science, Lund University, Lund, Sweden*


*Título de la Charla:*

# *A one-dimensional moving-boundary model for* tubulin-driven axonal growth

Fecha y Hora:

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Lugar:

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**Resumen**

Biological problem. Axons are "cable" that transmit electrical signals between neurons in animals and humans. An axon is created from one of the neurite sprouts from the cell body of a neuron and grows to its final length, which can be some millimeters up to meters. The main building material, the protein tubulin, is produced in the cell body and transported all the way to the growth cone, where it is used for the elongation of the cytoskeleton. The fact that axons can grow very long has initiated both experimental and theoretical investigations of the growth process.Model. The conservation of mass leads to a continuum model consisting of a coupled system of three differential equations. A partial differential equation models the dynamic and spatial behaviour of the concentration of tubulin that is transported along the axon from the soma to the growth cone. Two ordinary differential equations describe the time-variation of the concentration of free tubulin in the growth cone and the speed of elongation, respectively. Our model can be seen as an extension of the one presented by McLean and Graham. Results. All steady-state solutions of the model are categorized by means of the biological parameter values. Explicit expressions are given for each stationary concentration distribution. A linearized stability analysis of a given steady state is provided. Numerical simulations are presented based on the efficient, unconditionally stable and second order Peaceman-Rachford splitting method.


Informaciones: royarzua@ubiobio.cl y dmora@ubiobio.cl