

Venue

The annual seminar on Mathematics in (bio)Chemical Kinetics and Engineering will be held in the Pand, a renovated ancient building owned by Ghent University, and situated in the heart of Ghent's historical centre (address: Onderbergen 1).



Methusalem Funding
by the Flemish
Government



Faculty of Engineering
and Architecture



Faculty of
Bioscience Engineering



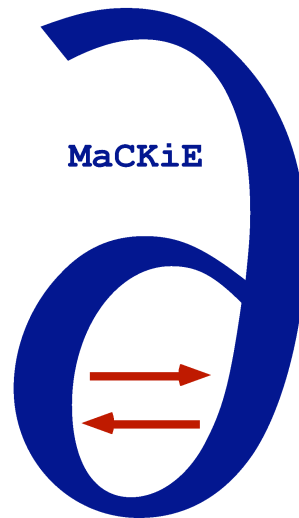
Invitation

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Mathematics in (bio)Chemical Kinetics and Engineering

MACKIE

Annual Seminar



Ghent University, Belgium

Wednesday, June 29, 2016

Organizing Committee

- Denis Constaes (NaM²)
- Geraldine J. Heynderickx (LCT)
- Guy B. Marin (LCT)
- Ingmar Nopens (BIOMATH)
- Kevin M. Van Geem (LCT)

Program

- 10:15 Registration
- 10:30 A.V. Panfilov, *Anatomical modeling of electrical and mechanical function of the heart*
- 11:30 N.G. Deen, *Bubbles on the cutting edge or how to intensify bubble column reactors*
- 12:30 Lunch
- 13:30 J. Wicks, *Arterial flow to activated sludge: Biomedical Computational Fluid Dynamics and wastewater treatment*
- 14:30 Concluding remarks and closing address

**Welcome to the 2016
annual seminar on
Mathematics in (bio)Chemical
Kinetics and Engineering**

The *Research Group for model-based analysis and optimisation of (bio)processes (BIOMATH)*, the *Laboratory for Chemical Technology (LCT)* and the *Research Group for Numerical analysis and Mathematical Modelling (NaM²)* of Ghent University are pleased to invite you to attend the annual seminar on “Mathematics in (bio)Chemical Kinetics and Engineering” which will be held on June 29, 2016 in Ghent, Belgium.

After the successful international Mackie-20(02,07,09,11,13,15) conferences and Mackie-20(03,04,05,06,08,10,12,14) annual seminars, the local organizers at Ghent University have again invited three world-class experts from the fields of mathematics and (bio)chemical engineering, Prof. N.G. Deen (Eindhoven University of Technology), Prof. A.V. Panfilov (Ghent University) and Dr. J. Wicks (The Fluid Group, Oxford, UK) to give seminar talks during a one-day mini-symposium.

Please e-mail to Denis.Constales@UGent.be to register. A complimentary lunch is offered to the participants at the venue.

Bubbles on the cutting edge or how to intensify bubble column reactors

Prof. N.G. Deen
Eindhoven University of Technology

In this lecture, I will explain our philosophy for modelling multiphase flow systems. In essentially every multiphase flow system we deal with a very large range of time and length scales, which cannot be resolved by a single universal model. For this reason, we apply a multiscale modelling strategy, where small scale direct numerical simulation models are used to develop closure equations that are required to close coarse grained models. I will illustrate our multiscale strategy with one application example: an bubble column with micro-structuring to intensify the gas-liquid contact. All models are validated against experimental data that we obtain with state-of-the-art multiphase measurement techniques.

Anatomical modeling of electrical and mechanical function of the heart

Prof. A.V. Panfilov
Ghent University

From mathematical point of view excitation of the heart is described by a system of non-linear parabolic PDEs of the reaction diffusion type with anisotropic diffusion operator. Cardiac arrhythmias correspond to the solutions of these equations in form of 2D or 3D vortices characterized by their filaments.

In my talk I will report on modeling mechano-electric feedback in the heart using reaction-diffusion mechanics systems and ventricular fibrillation mechanisms due to deformation of cardiac tissue and present our recent studies on arrhythmias due to early after depolarizations (EADs). We discuss importance of heterogeneity for the onset of the arrhythmias and possibilities of application of our approaches to clinic.

Arterial flow to Activated Sludge: Biomedical Computational Fluid Dynamics and Wastewater Treatment

Dr. J. Wicks
The Fluid Group, Oxford (UK)

In recent years, a significant effort has been devoted to the development of highly porous amorphous structures. Understanding how these materials interact with the human body is a formidable obstacle to overcome. Computational fluid dynamics (CFD) offers a flexible framework. Unlikely as it might seem, one of the closest parallels is wastewater treatment where recent advances in computational fluid dynamics have added biokinetics and Lagrangian solids transport alongside multiphase hydraulics. Specific examples of this cross-disciplinary cross-over will be presented.