## Plenary Lectures
## Conférences plénières

**NICOLAS BERGERON**, École normale supérieure
*Linking in torus bundles and Hecke L functions*

Torus bundles over the circle are among the simplest and cutest examples of 3-dimensional manifolds. After presenting some of these examples, using in particular animations realized by Jos Leys, I will consider periodic orbits in these fiber bundles over the circle. We will see that their linking numbers — that are rational numbers by definition — can be computed as certain special values of Hecke L-functions. Properly generalised this viewpoint makes it possible to give new topological proof of now classical rationality or integrality theorems of Klingen-Siegel and Deligne-Ribet. It also leads to new related results that I will briefly allude to. All this is extracted from joint works with Pierre Charollois, Luis Garcia and Akshay Venkatesh.

**IRENE FONSECA**, Carnegie Mellon University
*Geometric Flows and Phase Transitions in Heterogeneous Media*

We present the first unconditional convergence results for an Allen-Cahn type bi-stable reaction diffusion equation in a periodic medium. Our limiting dynamics are given by an analog for anisotropic mean curvature flow of the formulation due to Ken Brakke. As an essential ingredient in the analysis, we obtain an explicit expression for the effective surface tension, which dictates the limiting anisotropic mean curvature. This allows us to demonstrate the regularity and uniform ellipticity of the limiting surface tension.

This is joint work with Riccardo Cristoferi (Radboud University, NL), Adrian Hagerty (Edge Case Research), Cristina Popovici, and Rustum Choksi (McGill), Jessica Lin (McGill), Raghavendra Venkatraman (CMU).

**YVAN SAINT AUBIN**, Université de Montréal
*Teaching modeling in first year - Un cours de modélisation en première année*

A new first-year course in modeling was created at the Département de mathématiques et de statistique at Université de Montréal. It is compulsory for students in the pure and applied stream and in the statistics one. Anne Bourlioux and I created the course in 2018, following the guidelines in GAIMME*. I shall report on the successes and pitfalls of the three first editions of the course. I'll also reflect on the similarities between this modeling course and the abstract ones given at the beginning of the programme, like the first real analysis course.

* GAIMME stands for the Guidelines for Assessment and Instruction in Mathematical Modeling Education (2016), a report cosponsored by SIAM and COMAP.

Un nouveau cours de première année en modélisation a été créé au Département de mathématiques et de statistique de l'Université de Montréal. Il est obligatoire pour les étudiants des orientations maths pures et appliquées, et statistique. Anne Bourlioux et moi créèrent le cours en 2018, suivant de près les lignes directrices de GAIMME*. Je décrirai les succès et difficultés des trois premières éditions du cours. Je réfléchirai également aux similarités entre ce cours de modélisation et ceux plus abstraits de première année, tel le cours d'analyse réelle. La conférence sera donnée en anglais.

* GAIMME est le rapport « Guidelines for Assessment and Instruction in Mathematical Modeling Education » (2016) publié conjointement par SIAM et COMAP.