

Chaire De La Vallée Poussin prize lectures 2020/21



Tuesday, 14 December 2021 - Friday, 17 December 2021

Scientific Programme

Chaire de la Vallée Poussin 2020-21
Prize lectures by
Guido De Philippis (Courant Institute New York University)

General title:

The interplay between differential constraints and pointwise inclusions: old and new results and applications

Inaugural lecture, Tuesday 14 December 2021 at 4.15 pm

PDE constrained inclusions: A general overview

Several problems in analysis and geometry can be reduced to the study of a pointwise inclusion coupled with a linear differential constraint. This point of view, starting with the seminal work of Murat and Tartar, has revealed itself to be extremely fruitful. I will present a general overview on these ideas with a series of old and new results which can be obtained.

Lecture 1: Wednesday 15 December 2021 at 4.15 pm

PDE constrained inclusions: Oscillation and compensated compactness

Differential constraints can strongly restrict possible oscillation of weakly convergent sequences. Once this is coupled with a pointwise constraint, it is often possible to recover strong convergence of the sequence. This is the main idea behind the Murat and Tartar theory of compensated compactness. I will give some details on these ideas and on their applications.

Lecture 2: Thursday 16 December 2021 at 4.15 pm

PDE constrained inclusions: concentration and fine properties of PDE

While the interplay between a differential constraint and oscillation has been understood for years, much less is known concerning possible concentration. I will present some recent works in collaboration with F. Rindler in which we describe the structure of singular measures satisfying a differential constraint.

Lecture 3: Friday 17 December 2021 at 3.30 pm

An application: The converse of Rademacher's theorem

I will show some surprising application of the structural results for measures satisfying a differential constraint to the study of Lipschitz functions. In particular I will show how combining the ideas developed by Alberti, Csornéyi, Marchese and Preiss with the result presented in the previous lecture, one can characterize those measures for which Rademacher's theorem holds true.