Chaire
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Toutes les leçons seront données
en l'auditoire de la Vallée Poussin de
l'Institut de mathématiques pures et appliquées,
chemin du Cyclotron, 2 à Louvain-la-Neuve

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The theories of nonlinear diffusion

Juan Luis VAZQUEZ

Leçon inaugurale
Mardi 26 mai 16h
The theories of nonlinear diffusion

Mercredi 27 mai 16h
Porous medium flows.
Free boundaries and asymptotics.

Jeudi 28 mai 14h
Fast diffusion equations.
The connection with physics and geometry.

Vendredi 29 mai 10h
Some recent results.
Logarithmic travelling waves, diffusion with fractional operators and flows on manifolds.

Abstract : In this series of talks we will examine the main lines and some of the recent results in the theory of the nonlinear heat flows known under the label of Nonlinear Diffusion, focusing on the theory of porous medium flows as a paradigm. We will describe the optimal existence theory based on peculiar estimates and the typical features, like finite propagation, free boundaries and extinction in finite time. We will also stress the strong connection with theory of nonlinear elliptic equations, in particular equations of the Fokker-Planck form and reaction-diffusion form. A main area of research consists of the study of the long-time behaviour of heat flows. Stability questions for solutions of elliptic equations relate to interesting questions for the convergence of parabolic flows, and this also leads to functional inequalities of Hardy-Poincar\'e type. Geometrical questions are very relevant now and some will be presented, like connections with Ricci and Yamabe flows.