

## 69th Kyoto Ekimae Seminar

### 第69回 京都駅前セミナー (拡大版)

October 13, 2017

Venue: Room 7, 6th-floor, Campus Plaza Kyoto, The Consortium of Universities in  
Kyoto

<http://www.consortium.or.jp/about-cp-kyoto/access>

### Abstracts of the lectures

#### Blow-up analysis for nodal radial solutions in Moser-Trudinger critical equations in $\mathbb{R}^2$

Daisuke Naimen (Muroran Institute of Technology)

We consider low energy nodal radial solutions of Moser-Trudinger critical equations in  $\mathbb{R}^2$ . We study the asymptotic behaviour of them as the growth rate of the nonlinearity goes to a borderline between the existence and nonexistence of nodal radial solutions. We show if the solution has  $k$ -interior zeros, it exhibits a multiple blow-up behaviour on the first  $k$  nodal sets while, on the  $(k + 1)$ -th one, it strongly converges to the least energy solution of a critical equation of the borderline case. We also prove that each concentration part, with an appropriate scaling, converges to a solution of the classical Liouville problem in  $\mathbb{R}^2$ . This talk is based on a joint work with Prof. M. Grossi at Sapienza University of Rome.

#### On the solution structure of bistable reaction-diffusion equations on a thin tubular domain

Toro Kan (Tokyo Institute of Technology)

On a thin tubular domain, we consider scalar bistable reaction-diffusion equations with the Neumann boundary condition. The domain shrinks to a line segment, while only the middle part shrinks much faster than the other part. Since the domain is close to a line segment, the equation is expected to be approximated by some one-dimensional limiting equation. After introducing what the appropriate limiting equation should be, we show that it indeed approximates the original equation. Then we discuss the solution structure of the limiting equation.

## Approximation of BV functions and Sobolev norms by non-local non-convex functionals

Hoi-Minh Nguyen (Écoloe Polytechnique Fédérale de Lausanne)

In this talk, I will discuss various results concerning the approximation of the total variation and Sobolev semi-norms by non-local, non-convex functionals. Due to the lack of convexity, the mode of convergence is extremely delicate and many phenomena/pathologies appear. This is partially based on joint work with Jean Bourgain and Haim Brezis.

## New perspectives and results for Hardy's and Caffarelli, Kohn, Nirenberg's inequalities.

Hoi-Minh Nguyen (Écoloe Polytechnique Fédérale de Lausanne)

In this talk, I present Hardy's and Caffarelli, Kohn, Nirenberg's inequalities for fractional Sobolev spaces and their improvements in the classical setting where the information of the gradient is replaced by the one of some non-local functionals (appeared in the first talk). This is based on joint work with Marco Squassina. Interestingly, our proofs of these results are quite simple modulus the ones of Poincaré's inequalities for an annulus which are also straightforward for many settings.