**Master 2:** ***International Centre for Fundamental Physics***

## ***INTERNSHIP PROPOSAL***


Laboratory name: INSP
CNRS identification code: UMR 7588
Internship director'surname: AQUA Jean-Noël
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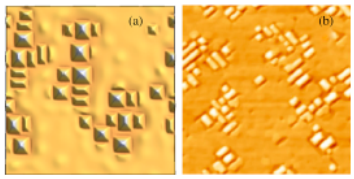
Internship location: UPMC, Jussieu, Paris

Thesis possibility after internship: YES ; Funding : requested ; type of funding : ANR

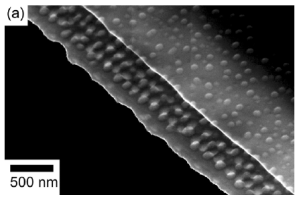
### Dynamical analysis of quantum dot growth on nano-membranes

The self-organization of quantum dots on top of strained films is a well-defined phenomenon. It is an intrinsically out-of-equilibrium problem driven by elastic interactions. Appropriate dynamical theoretical frameworks may rationalize many peculiarities of such a growth (spatial ordering, coarsening...) [1,2], but its application to « exotic » geometries and systems is still puzzling.



*Comparison theory/experiments of quantum dots growth [2].*

Indeed, the growth on patterned substrates, soft substrates, nano-membranes or ribbons is under active scrutiny both for the challenging investigation of geometry effects and for their potential applications. The geometry is crucial in such systems as the long-range elastic interactions, coupled with dynamics, can build non-trivial finite-size effects. Recently, the growth on nanomembranes and nanoribbons drew a signification attention due to their flexibility for strain accomodation [3].




*Growth of quantum dots on a nanoribbon*

In this internship, we will focus on the morphological evolution of strained nano-membranes. The student will investigate the dynamical analysis of surface diffusion equations. Different geometries will be investigated to better describe experiments. Of special interest is the case of a membrane that can undergo strain-sharing with another one, or with that satisfies a free-boundary condition. The student will perform linear analysis of the problem and possibly its non-linear behavior. Possible numerical analysis could be performed. Comparison with experiments done in a collaborating group will be done.


[1] J.-N. Aqua, I. Berbezier, et al, Phys. Rep. **522** (2013) 59
[2] J.-N. Aqua, A. Gouyé, et al, Phys. Rev. Lett. **110** (2013) 096101
[3] M.M. Roberts, et al, Nature Mater. **5** (2006) 388; H. Zhou, et al, Sci. Rep. **3** (2013) 1291


Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: YES Macroscopic Physics and complexity: YES
Quantum Physics: NO Theoretical Physics: YES