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## Séminaire PMMH

*Bureau d'Études, Bâtiment L, 2<sup>ème</sup> étage*

*Vendredi 31 mars 2017, 11h00-12h00*

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#### **Design of three-dimensional objects using stress relaxation in thin films : the interplay between mechanics and geometry**

It is well-known that a free pre-stressed elastic bi-layer will deform so as to "relax" its total energy. The relaxation process may deform simple straight segments to rolls, or curls, etc. In an attempt to cover more complex three-dimensional geometries we address and solve the general question concerning the relaxation of an arbitrary planar curve. We illustrate our theoretical findings by the design and fabrication of several three-dimensional spherical objects using pre-stressed semiconductor layers. The multilayered stack is obtained by molecular beam epitaxy (MBE), a growth method that allow very accurate control of the composition, lattice mismatch and thickness. We explore the range of the validity of our results from 70 to 400 nm thick multi-layer semiconductors and illustrate geometrical incompatibilities between the planar and spherical geometries. Using the analogy between classical crystals and photonic crystals, we explore the design and fabrication of the more exotic objects, the "single-wall photonic nano-tubes". We discuss the limitations of the method as well as, open questions.

