## ΓΕΝΙΚΟ ΣΕΜΙΝΑΡΙΟ ΤΜΗΜΑΤΟΣ ΦΥΣΙΚΗΣ

# PHYSICS COLLOQUIUM

## Thursday, 8 May 2008
### 17:00-18:00

### 3rd Floor Seminar Room

### "Localizing energy through nonlinearity and discreteness - without and with disorder"

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Abstract

I will review results on localization of excitations in nonlinear lattice models with translational invariance. Exact solutions are known to be time-periodic and spatially localized (coined discrete breathers, intrinsic localized modes, discrete solitons). They appear generically for many realizations, and an be easily excited in various ways. An impressive pool of experimental data has been collected in recent years as well. I a second part, I will apply the concept of discrete breathers to normal mode space. Consequently, I will show that time-periodic solutions which are localized in normal mode space presist in the presence of nonlinearity. These q-breather solutions give a quantitative account for a whole set of so far puzzling data collected within the frame of the famous Fermi-Pasta-Ulam problem of nonequipartition. In a third part, I will discuss recent results on the propagation of wave packets in nonlinear and disordered systems. Disorder localizes all normal modes at the linear level. Nonlinearity induces an interaction between them. Will a localized wave packet therefore spread ad infinitum or not? Contradicting expectations and numerical data will be explained, and the ultimate question of localization versus delocalization will be addressed.