



پژوهشگاه دانش‌های بنیادی  
پژوهشکده ذرات و شتابگرها و پژوهشکده نجوم

## Speaker1: Bahram Mashhoon , University of Missouri, Columbia and IPM

**Title:** Nonlocal Gravity

**Abstract:** A classical nonlocal generalization of Einstein's theory of gravitation has recently been developed via the introduction of a scalar causal "constitutive" kernel that must ultimately be determined from observational data. It turns out that the nonlocal aspect of gravity in this theory can simulate dark matter; indeed, in the Newtonian regime of nonlocal gravity, we recover the phenomenological Tohline-Kuhn approach to modified gravity. A simple generalization of the Kuhn kernel in the context of nonlocal general relativity leads to a two-parameter modified Newtonian force law that involves an additional repulsive Yukawa-type interaction. We determine the parameters of our nonlocal kernel by comparing the predictions of the theory with observational data regarding the rotation curves of spiral galaxies. The best-fitting stellar mass-to-light ratio turns out to be in agreement with astrophysical models; moreover, our results are consistent with the Tully-Fisher relation for spiral galaxies. Light deflection in nonlocal gravity is consistent with general relativity at Solar System scales, while beyond galactic scales an enhanced deflection angle is predicted that is compatible with lensing by the effective "dark matter". Furthermore, we extend our results to the internal dynamics of rich clusters of galaxies and show that the dynamical mass of the cluster obtained from nonlocal gravity is consistent with the measured baryonic mass.

**Time:** Wednesday, January 8, 2014 at 13:30

## Speaker2: Sohrab Rahvar , Perimeter Institute(PI), Canada and IPM

**Title:** Solving problem of missing mass with Non-local gravity: From galactic scale to the cluster of galaxies.

**Abstract:** In the extension of General Relativity to a Non-Local theory, it contains a kernel function which has to be determined by the dynamics of structures from the solar system to the cosmological scales. In the weak field approximation, we confront the dynamics of galaxies with the modified Poisson equation which has two free parameters from a specific Kernel function. After fixing these parameters with the galaxies in THINGS catalog, we apply our effective potential to the Ursa-Major catalog of galaxies with the stellar mass-to-light ratio as the only free parameter. The best fit value for this parameter has a good correlation with the color of galaxies, compatible with the astrophysical discoveries and satisfy the Tully-Fisher relation. Finally, we test the X-ray Chandra clusters and show that, using the gas and galaxies of a cluster, we obtain almost the same value for the dynamical and baryonic mass of clusters. This theory along with MOG-theory of gravity, for the first time can explain the dynamics of structures in the universe from the solar system to the Mega-Parsec scales without need to Dark Matter.

**Time:** Wednesday, January 8, 2014 at 15:00

مکان : اتاق سمینار شتابگر ملی ایران