

THE UNIVERSITY OF HONG KONG
JOINT COLLOQUIUM OF DEPARTMENT OF PHYSICS &
DEPARTMENT OF EARTH SCIENCES

**Distinguishing between Particle and "Wave" Dark-Matter with
New Hubble Observations of the Most Massive Cosmic Lenses**

Prof. Thomas Broadhurst

University of the Basque Country

Time: Thursday, January 31, 2013, 4:30 p.m.

**Venue: Lecture Theatre P4, Chong Yuet Ming Physics Building,
The University of Hong Kong**

Abstract:

I will present the latest results from our ongoing Hubble "Treasury" program aimed at addressing the anomalous mass profiles of the most massive objects in the cosmos. Excessive concentrations of dark matter have been uncovered for a sample of 25 galaxy clusters, in excess of the expectations of the standard LCDM cosmology. To this we add wide-field imaging with the Subaru 8.3m telescope and compare weak lensing distortions and magnifications to establish very accurate equilibrium mass profiles, out beyond the virial radius of these clusters. High speed cluster motions provide another clue that all is not quite as expected - and I will discuss these new problems in the context of a broader picture for the nature of cold dark matter that we are investigating in which very light bosonic material may condensate and show macroscopic interference and "solitonic" motions when clusters collide. New cosmological simulations of this form of dark matter will be presented, confirming in detail that there is no obvious contradiction of this form of wave-like cold dark matter with the observed distribution of large scale structure, but instead a desirable suppression of low mass galaxies is found relative to standard particle based CDM.

About the Speaker:

Thomas is the Ikerbasque Research Professor at the department of Theoretical Physics, University of the Basque country. He has pioneered the main gravitational lensing techniques used today, namely weak lensing, cluster lens magnification from background galaxy counts, and multiple image detection in the strong lensing regime for clusters. Furthermore, Thomas has applied the techniques he developed to the best quality data currently available as a member of the Advanced Camera Team for the Hubble Space Telescope (for which the team received the exceptional achievement award from NASA in 2004) and with wide field imaging data from the Subaru telescope. Within the field of cluster lensing, Thomas and his collaborators have provided the only credible measurements of the full radial mass profiles of galaxy clusters. Thomas is currently focused on a recently approved Hubble Treasury Program - the largest program ever awarded with the Hubble Space Telescope - to follow up on previous work that suggest cluster concentrations are anomalously high compared to standard Lambda Cold Dark Matter predictions. The principal aim of this program is to measure the mass concentrations of a representative statistical sample of relaxed clusters to provide a definitive test of cosmological models.



Physics colloquium series is organized to introduce cutting edge researches and new development in physics, designed to be suitable to graduate and undergraduate students, and also to scientists working on different fields. Each colloquium will generally start with an extensive introduction of the background of the field, followed by forefront research topics and results. The colloquium will serve as an education forum for students and laymen alike, and also serve as a platform for exchange and update their knowledge of various branches of physics among academic staff members.

Coffee and tea will be served 20 minutes prior to the colloquium
Anyone interested is welcome to attend

Physics Department, HKU Phone: 28592360 Fax: 25599152.