東京大学大学院理学系研究科・理学部
物理学教室　談話会

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A wave-particle duality at a macroscopic-scale: the role of a path memory

2015年10月30日（金） 午後4時30分～午後6時00分

東京大学理学部 4 号館 3 階 1320 号室

The behavior of the fundamental objects of physics at quantum scale is dominated by their wave-particle duality. This characteristic is usually thought to have no equivalent in macroscopic physics where mass-like objects and waves are distinct entities. We have shown recently that a droplet bouncing on a vertically vibrated liquid interface can become dynamically coupled to the surface wave it excites. It thus becomes a self-propelled "walker", a symbiotic object formed by the droplet and its associated wave.
Through several experiments, we addressed one central question. How can a continuous and spatially extended wave have a common dynamics with a localized and discrete droplet? Surprisingly, in spite of the classical nature of this system, several quantum-like behaviours emerge. I will specifically discuss recent experiments in which a walker, confined in a potential well, has an orbiting motion. In this situation the possible orbits exhibit both a form of quantization(1) and probabilistic behaviours(2). I will show that these dynamical behaviours are linked to a temporal non-locality: the wave-field associated to a walker contains a memory of the recent trajectory of the droplet.

(1) S. Perrard, M. Labousse, M. Miskin, E. Fort, & Y. Couder, Nature Com. 5, 3219, (2014)
(2) S. Perrard, M. Labousse, E. Fort, Y. Couder, Phys Rev Lett, 113, 104101, (2014)

※ 専門外、学生の方にもわかりやすくお話し頂く予定です。

※ 4号館3階の1320号室内にお茶とお菓子を用意しています。どうぞご利用下さい。