Topological catalysis: continuous production of topological excitations assisted by a topological excitation

Sho Higashikawa

(U. of Tokyo)

Place: **Room K202, Main Building, Yukawa Institute, Kyoto U**
Date: **Feb. 27 (Monday), 2017**
Time: **14:00-15:00**

Abstract: Recently, great experimental developments have been achieved in the creation and observation of topological excitations in a variety of fields including chiral magnets and ultracold atomic gases, opening up the possibility for studying the phenomenon unique to multiple topological excitations. A fundamental question that follows is how topology manifests itself there. One notable example is the collision of non-Abelian vortices, where noncommutativity between their topological charges ensures the formulation of a rung vortex when they collide [1,2]. In this seminar, we point out yet another example in which topology plays a key role in multiple topological excitations. We show that topological solitons can be produced continuously with the help of topological defects. We call this phenomenon topological catalysis since the latter is not affected in this process and this process is topologically prohibited without the latter. Examples of the topological catalysis include the continuous production of skyrmion pairs with the help of a half(-quantum) vortex, and that of knots with even linking numbers with the help of a monopole. To mathematically describe the topological catalysis, we employ the Whitehead product, which is a generalization of the commutator of topological charges of two vortices.

[1] V. Poenaru and G. Toulouse, J. Phys. 38 887 (1977).

[2] M. Kobayashi, et al. Phys. Rev. Lett. 103, 115301 (2009).

Host: Masatoshi Sato [YITP]