

Accepted mini-colloquia in CMD32-ÖPG75, Graz, Sep 2026

OePG-CMD-Graz2026

32nd Meeting of the Condensed Matter Division, European Physical Society

75th Annual Meeting of the Austrian Physical Society

Sun.20 – Fr. 25 September 2026, Graz Center of Physics, Graz, Austria

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TITLE: LODY2026: LOCALIZATION DYNAMICS IN MATTER AND WAVES

<https://oepeg-cmd-jointmeeting2026.uni-graz.at/en/mini-colloquia/m13-localization-dynamics-in-matter-and-waves/>

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KEYWORDS

Localization, solitons, topological phenomena, nonlinear phenomena

ABSTRACT

Solitons are ubiquitous examples of spatial localization, often in movement. They include discrete breathers as envelope solitons. Striking examples in water are tsunamis and bores, but they appear in many other systems as optical waveguides, Josephson junction arrays, Bose-Einstein condensates, matter waves, and biological molecules, to name a few. Solitons appear both in theory, classical and ab-initio nonlinear dynamics, and experiments. They often have long lives, which may hinder heat evacuation in tokamak fusion reactors. Polarons and solitons consist of a charge bounded to a local deformation and/or localized vibrational modes. They are often described using semi-classical models within the tight-binding approximation. Localization can also be in momentum as q-breathers, or in time, as rogue waves. Metamaterials allow for the engineering of especial properties including solitons. With time modulation, time crystals appear, as proposed by Nobel Laureate Frank Wilczek in 2012. Space-time metamaterials bring about new properties of localized excitations that appear within the frequency or momentum bandgaps. Electrons have also been described as topological solitons with Coulomb and Lorenz forces as a consequence, in this way, expanding the soliton concept to particle physics. This mini-colloquium intends to review recent advances and unify theories and approaches.

INTERESTED SPEAKERS

Juan FR Archilla, Tassos Bountis, Larissa Brizhik, Luis A Cisneros-Ake, Yusuke Doi, Manfred Faber, Sergej Flach, Panayotis Kevrekidis, Vassilis Koukoulouyannis, George Kopidakis, Masayuki Kimura, Francesco Piazza, Nathan Russell Bisset, Víctor J Sánchez-Morcillo, Duilio de Santis, George Tsironis.

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