



ECT*



EUROPEAN CENTRE FOR THEORETICAL STUDIES IN NUCLEAR PHYSICS AND RELATED AREAS

TRENTO, ITALY

Institutional Member of the European Expert Committee NUPECC



Castello di Trento ("Trint"), watercolor 19.8 x 27.7, painted by A. Dürer on his way back from Venice (1495). British Museum,

Neutrini and nuclei, challenges and opportunities for nuclear theory

Trento, May 27-31, 2019

Main topics

Current- and next- generation neutrino-oscillation experiments require nuclear physics calculations of structure and electroweak properties of atomic nuclei with quantified theoretical uncertainties. Nuclear effective field theories (EFTs) allow for a systematic derivation of the nuclear hamiltonian and many-body currents, both required to describe neutrino's interactions with nuclei. Despite this success, there are key points that remain to be determined and that will be the main focus of our workshop:

- i) Test the extent and validity of EFTs: we present available models for inter-nucleon interactions and consistent electroweak many-body nuclear currents from EFTs. We discuss open issues, such as, determination of the free-parameters (LECs) entering the models from both experiments and lattice QCD calculations; sensitivity of these models to cut-off variations; applicability of EFT-based operators to larger values of energy and momentum transfer.
- ii) How to transition to regions where single-nucleon excitations, resonance- and meson-production occur : we present available phenomenological models applicable at higher values of energy and momentum transfer. We discuss open issues, such as, how to benchmark phenomenological models to the low-energy description provided by EFTs; how to consistently incorporate single-nucleon excitations, resonance- and meson-production.
- iii) How to properly incorporate relativistic effects: we present available relativistic models and discuss how to incorporate relativistic effects retaining the complexity of nuclear dynamics. We will seek for connections with EFT-based non-relativistic calculations in the intermediate momentum-transfer region. Strategies involving controlled approximations of the nuclear many-body problem, such as the use of spectral functions and momentum distributions, will be discussed.

Keynote speakers

S. Bacca (*Johannes Gutenberg-Uni Mainz*), A. Baroni (*Uniof South Carolina*), H. Krebs (*Ruhr University Bochum*), A. Parreño (*Uni of Barcelona*), M. Piarulli (*Washington Uni*), M. Savage (*Uniof Washington*), R. Schiavilla (*Jefferson Laboratory*), L. Alvarez-Ruso (*IFIC-CSIC Uni Valencia*), R. Gonzalez Jimenez (*Complutense Uni of Madrid*), E. Hernandez (*Uni of Salamanca*), J. Ryckebusch (*Ghent Uni*), T. Sato (*Osaka Uni*), O. Benhar (*INFN Roma*), J. Caballero (*Uni of Sevilla*), J. Carlson (*LANL*), A. De Pace (*INFN Torino*), A. Nikolakopoulos (*Ghent Uni*), W. van Orden (*Jefferson Laboratory*), A. Blin (*Johannes Gutenberg-Uni Mainz*), J. E. Sobczyk (*IFIC-CSIC Uni Valencia*)

Organizers

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Juan Nieves (*Instituto de Fisica Corpuscular - CSIC & Universidad de Valencia*)
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