

TALENT/INT Course

Nuclear forces and their impact on structure, reactions, and astrophysics
University of Washington, Seattle, WA July 1 – July 19, 2013

The TALENT/INT course on “Nuclear forces and their impact on structure, reactions and astrophysics” is part of the TALENT initiative (“Training in Advanced Low-Energy Nuclear Theory”) to develop a graduate program of excellence in low-energy nuclear theory. The program will build a network of strong connections between universities and research laboratories and institutes worldwide, and provide a unique and in-depth training ground for the future needs of nuclear physics. More details about the TALENT initiative and other courses can be found at <http://nucleartalent.org>.

The TALENT/INT course to be given in July, 2013 aims at teaching modern theoretical approaches to nuclear forces and their impact on nuclear structure, reactions and astrophysics. This includes the development of pionless and chiral effective field theory, with a focus on which parts of nuclear forces drive different physics in light to heavy nuclei and at neutron-rich extremes. A problem-based approach is emphasized; computational topics will be integrated with the physics topics. The principal lecturers will be Dick Furnstahl and Achim Schwenk. The preliminary list of content is:

- Introduction to the strong interaction: QCD, pions and nucleons.
- Nucleon-nucleon scattering.
- Nuclear forces at low energies, symmetries, and pionless EFT.
- Universal large scattering length physics.
- Tensor and spin-orbit forces, deuteron properties.
- Chiral effective field theory.
- Three-nucleon forces.
- Connections to electroweak processes.
- Impact on properties of light to heavy nuclei.
- Impact on neutron and nuclear matter.

The target groups for the course include both theorists and experimentalists with at least one year of PhD course experience (for Europe: at least advanced MSc). Prior knowledge of field theory is not assumed.

Lecture notes and additional reading material will be provided. There will be three weeks of focused lectures by the principal lecturers and exercise sessions run by postdoc-level instructors to assist students with exercises associated with the course and in preparation of individual projects. We anticipate that the classes will be offered online.

The number of participants will be limited to 25. Local support will be provided to all participants, but travel costs cannot be covered. Applications will be accepted until February 28, 2013. Details on how to apply for the course will be posted soon at the TALENT/INT website: <http://www.int.washington.edu/PROGRAMS/talent13/>.

Course organizers: Dick Furnstahl, Morten Hjorth-Jensen, Witek Nazarewicz, Achim Schwenk