

NUCLEAR PHYSICS RESEARCH

at



THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

Nuclear physics at UNC focuses on how the strong and weak interactions manifest themselves in nuclei as well as on using the nucleus as a laboratory to study astrophysics, particle physics and the symmetries of nature. There are opportunities for students in all of these areas:

Experimental Nuclear and Astroparticle Physics

REYCO HENNING | JOHN WILKERSON

The UNC group is playing a leading role in MAJORANA, an international collaboration searching for neutrinoless double beta decay in ^{76}Ge . The collaboration is currently taking data with the MAJORANA DEMONSTRATOR at the Sanford Underground Research Facility in South Dakota and planning the next generation experiment. We are also involved in the KATRIN tritium beta-decay experiment, a direct measurement of neutrino mass. Other activities include experiments to probe fundamental conservation laws and searches for different possible types of dark matter.



Graduate student Chelsea Bartram receiving the 3rd-place award for her poster at TAUP17. The award was given by Nobel laureates Takaaki Kajita and Art McDonald

Nuclear Astrophysics

CHRISTIAN ILIADIS | ART CHAMPAGNE | ROBERT JANSSENS

UNC is a world-class center for experimental and theoretical research on nuclear reactions and their importance in the evolution of stars and the origin of the elements. Current research topics include abundance anomalies in globular clusters and the evolution of the early galaxy, the production of the elements heavier than iron, the evolution of stars more massive than the sun and radioactive aluminum in the galaxy and in the early solar system.

Nuclear Structure

ROBERT JANSSENS | CHRISTIAN ILIADIS | ART CHAMPAGNE

Our focus is on the low-excitation structure of medium-mass and heavy nuclei, specifically on how nuclear shapes and shell structure evolve on the proton- and neutron-rich sides of stability. This work directly impacts our understanding of the nucleosynthesis of heavy nuclei as well as the matrix elements that describe neutrinoless double beta decay.

Nuclear Theory

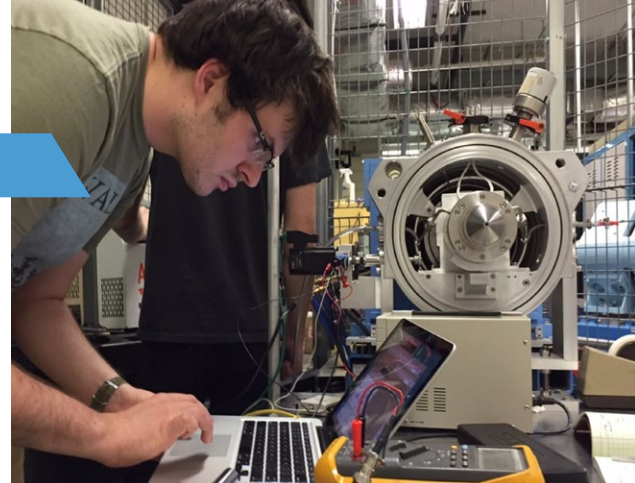
JOAQUIN DRUT | JON ENGEL | AMY NICHOLSON

The UNC nuclear theory group focuses on nuclear structure, fundamental symmetries, hadronic physics using lattice QCD, nuclear astrophysics and general many-body physics, in particular lattice Monte-Carlo methods. Recently, the group has (for example) calculated the nuclear matrix elements governing neutrinoless double beta decay, studied viscosity in strongly interacting gases of cold atoms, and modeled nucleosynthesis in stars and supernovae.



Triangle Universities Nuclear Laboratory (TUNL)

TUNL is one of four Department of Energy Nuclear Physics Centers of Excellence, with affiliated experimental and theoretical faculty from Duke, NC State, and UNC-Chapel Hill. Located on Duke's campus, TUNL draws collaborators worldwide, with opportunities in both accelerator and non-accelerator based research. Nuclear structure studies are performed at the High Intensity Gamma Source (HIγS), which provides 1 to 100 MeV γ -ray beams with fluxes of $10^8/s$, and at the 10-MV tandem van de Graaff accelerator laboratory. Nuclear astrophysics experiments are conducted at HIγS, the tandem and at the Laboratory for Experimental Nuclear Astrophysics (LENA). LENA holds the world record for average ion beam intensity on target among dedicated low-energy nuclear astrophysics laboratories. More than 8% of U.S. nuclear physics PhDs graduate annually from TUNL-related programs. Other programs at TUNL include research in fundamental symmetries and manifestations of quantum chromodynamics at low energies.



Graduate Student Jack Dermigny programming the movable extraction electrode for the new LENA ECR source



The University of North Carolina – Chapel Hill

UNC was established in 1789 as the nation's first public university. It ranked **6th amongst public universities** in U.S. News and World Reports 2018 rankings of national universities. U.S. News also ranks the Triangle region (Chapel Hill, Raleigh and Durham) as **#7 in their top 100 places to live** in the U.S. There is a lively arts and music scene and there are many opportunities for outdoor activities. In addition, the mountains are about a 3-hour drive and the shore is about 2.5 hours away.



The target date for graduate applications is Jan. 1 and the application website is at <http://gradschool.unc.edu/admissions/instructions.html>



Please visit our website for more information:
physics.unc.edu/research-pages/nuclear

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