Research in the Laboratory for Nuclear Science (LNS) (http://web.mit.edu/lns) seeks to understand the structures and interactions of the fundamental constituents of matter. Nuclear physics experiments are performed with electrons at the Thomas Jefferson National Accelerator Facility in Virginia and the Mainz Microtron (MAMI) accelerator facility in Germany; heavy ions at the Large Hadron Collider (LHC) at CERN in Switzerland and Brookhaven National Laboratory in New York; and neutrons at the Spallation Neutron Source at the Oak Ridge National Laboratory in Tennessee.

A new program in low energy nuclear physics has just begun, with experiments using precision laser spectroscopy of various atoms and radioactive molecules at the ISOLDE facility at CERN and the Facility for Rare Isotope Beams at Michigan State University, and construction of a development lab on the MIT campus. The high-energy particle physics program involves experiments with high-energy protons at the LHC; the search for antimatter and dark matter in space with the Alpha Magnetic Spectrometer on the International Space Station; exploration of cosmic X-rays with the NuSTAR satellite; development of equipment to search for axions; and silicon detector development for cosmic-ray signatures of dark matter with the general antiparticle spectrometer (GAPS) experiment. Properties of neutrinos are being explored through experiments at various sites, including Fermi National Accelerator Laboratory in Illinois; Karlsruhe, Germany; Kamioka Observatory, Japan; the South Pole; through the development of a new technique to measure neutrino mass through Cyclotron Radiation Emission Spectroscopy; and through research and development to build a cyclotron-based high-intensity source of neutrons. Searches for extremely rare, neutrinoless nuclear decays are taking place underground in Gran Sasso, Italy. A theoretical program investigates the properties of high-energy plasmas.

LNS supports research interests of faculty in the Department of Physics by supporting and administering facilities for studies of nuclear and particle physics, including the Center for Theoretical Physics, the MIT-Bates Research and Engineering Center, the MIT-Bates High Performance Research Computing Facility, and the MIT Central Machine Shop. Students participate in the entire range of research programs in fulfilling their graduate and undergraduate degree requirements or as participants in the Undergraduate Research Opportunities Program (UROP) (http://catalog.mit.edu/mit/undergraduate-education/academic-research-options/undergraduate-research-opportunities-program).

For further information, contact the director, Professor B. Wyslouch, Room 26-505, 617-253-7800.

The William H. Bates Research and Engineering Center (Bates Lab) is operated by LNS as a research and engineering center with particular emphasis on accelerator science and technology. Current efforts include the design, construction, and testing of new detector, target, magnet, and vacuum systems for experiments at Jefferson Lab, Brookhaven and other laboratories; development and testing of an atomic beam source of polarized $^3$He for an experiment to search for the electric dipole moment of the neutron; and development of new accelerator-based techniques to be used for cancer therapy.

For further information, contact the director, Professor B. Wyslouch, Room 26-505, 617-253-7800.

The Center for Theoretical Physics is engaged in a broad range of fundamental research activities in theoretical nuclear and particle physics, including study of the fundamental constituents of matter and the theory that governs them, the structure and interactions of nuclei and hadrons, electroweak physics, lattice hadron physics, field theory, string theory and quantum gravity, many-body physics, mathematical physics, cosmology, and quantum computation.

For further information, contact the director, Professor I. Stewart, Room 6-401, 617-253-4848.

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