

improving processes for using existing energy resources in an efficient and environmentally sound manner. Disciplinary areas where basic research is supported include atomic, molecular, and optical sciences; physical, inorganic, and organic chemistry; chemical physics; photochemistry; radiation chemistry; analytical chemistry; separations science; actinide chemistry; and chemical engineering sciences.

Program Contact: Phone—(301) 903–5804; Web site: <http://www.sc.doe.gov/bes/chm/chmhome.html>.

(c) Geosciences

The objective of this program is to develop a quantitative and predictive understanding of geologic processes related to energy and environmental quality. The program emphasizes cross-cutting basic research that will improve understanding of reactive geochemical transport and other subsurface processes and properties and how to image them using techniques ranging from electrons, x-rays or neutrons to electromagnetic and seismic waves. Applications of this fundamental understanding might include transport of contaminant fluids, hydrocarbons, sequestered carbon dioxide, or performance prediction for repository sites. The emphasis is on the disciplinary areas of geochemistry, geophysics, geomechanics, and hydrogeology with a focus on the upper levels of the earth's crust. Particular emphasis is on processes taking place at the atomic and molecular scale. Specific topical areas receiving emphasis include: high resolution geophysical imaging; rock physics, physics of fluid transport, and fundamental properties and interactions of rocks, minerals, and fluids. Program Contact: Phone—(301) 903–4061; Web site: <http://www.sc.doe.gov/bes/geo/geohome.html>.

(d) Energy Biosciences

The objective of this program is to generate an understanding of fundamental biological mechanisms in plants and microorganisms. The emphasis is on understanding biological processes that will be the foundation for technology developments related to DOE's mission to achieve environmentally responsible production and conversion of renewable resources for fuels, chemicals, and other energy-enriched products. This program has special requirements for the submission of preapplications, when to submit, and the length of the applications. Applicants are encouraged to contact the program regarding these requirements. Program Contact: Phone—(301) 903–2873; E-mail—

energy.biosciences@science.doe.gov; Web site: <http://www.science.doe.gov/bes/eb/ebhome.html>.

2. High Energy Physics

The primary objectives of this program are to explore the fundamental interactions of matter and energy, including the unseen forms of matter and energy that dominate the universe; to understand the ultimate unification of fundamental forces and particles; to search for possible new dimensions of space; and to investigate the nature of time itself. The research falls into three broad categories: experimental research, theoretical research, and a program of advanced R&D in accelerator and particle detector science and technology. The goal of the R&D program is to enable the design and fabrication of the instrumentation needed for the physics research.

In support of these broad scientific objectives, the High-Energy Physics program has established specific long-term goals that correspond very roughly to current research priorities, and are representative of the program:

- Measure the properties and interactions of the heaviest known particle (the top quark) in order to understand its particular role in the Standard Model.
 - Measure the matter-antimatter asymmetry in many particle decay modes with high precision.
 - Discover or rule out the Standard Model Higgs particle, thought to be responsible for generating mass of elementary particles.
 - Determine the pattern of the neutrino masses and the details of their mixing parameters.
 - Confirm the existence of new supersymmetric (SUSY) particles, or rule out the minimal SUSY "Standard Model" of new physics.
 - Directly discover, or rule out, new particles which could explain the cosmological "dark matter".
- All grant proposals should address one or more of these goals, or else explain how the proposed research supports the broad scientific objectives outlined above. More information on the program and the scientific research it supports can be found at our Web site: <http://doe-hep.hep.net/>.

Program Contact: (301) 903–3624.

3. Nuclear Physics

The Nuclear Physics program supports basic research, technical developments and world-class accelerator facilities to expand our fundamental understanding of the interactions and structures of atomic nuclei and nuclear matter, and an

understanding of the forces of nature as manifested in nuclear matter. Today, the reach of nuclear physics extends from the quarks and gluons that form the substructure of the once-elementary protons and neutrons, to the most dramatic of cosmic events—supernovae. These and many other diverse activities are driven by five broad questions articulated recently by the Nuclear Science Advisory Committee (NSAC) in the Opportunities in Nuclear Science: A Long-Range Plan for the Next Decade. The four subprogram areas and their objectives are organized around answering these five key questions. Research activities supported by the Office of Nuclear Physics are aligned with and contribute to the overall progress of the following long term performance measures:

- Make precision measurements of fundamental properties of the proton, neutron and simple nuclei for comparison with theoretical calculations to provide a quantitative understanding of their quark substructure.
- Recreate brief, tiny samples of hot, dense nuclear matter to search for the quark-gluon plasma and characterize its properties.
- Investigate new regions of nuclear structure, study interactions in nuclear matter like those occurring in neutron stars, and determine the reactions that created the nuclei of atomic elements inside stars and supernovae.
- Measure fundamental properties of neutrinos and fundamental symmetries by using neutrinos from the sun and nuclear reactors and by using radioactive decay measurements.

The program is organized into the following four subprograms:

(a) Medium Energy Nuclear Physics

This subprogram supports experimental research primarily at the Thomas Jefferson National Accelerator Facility and with the polarized proton collision program at the Relativistic Heavy Ion Collider (RHIC-Spin), directed at answering the first key question: What is the structure of the nucleon? Detailed investigations of the structure of the nucleon are aimed at understanding how these basic building blocks of matter are constructed from the elementary quarks and gluons of Quantum Chromo-Dynamics (QCD) and how complex interactions among them generate all the properties of the nucleon, including its electromagnetic and spin properties. New knowledge in this area would also allow the nuclear binding force to be described in terms of QCD, thus providing a path for