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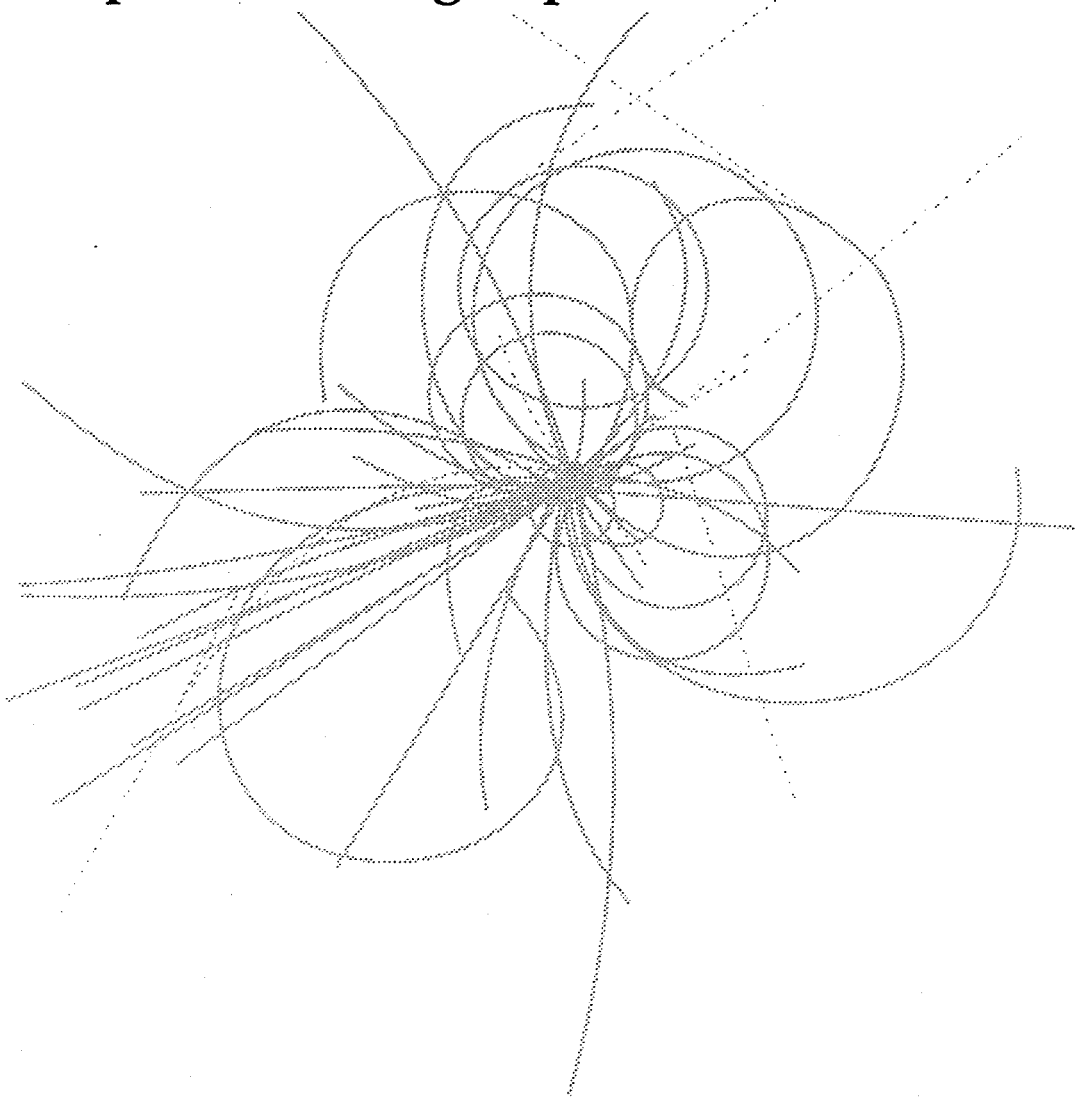
Superconducting Super Collider Laboratory



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SSC EDUCATION: SCIENCE TO CAPTURE THE IMAGINATION

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To the great majority of Americans, science is merely a collection of facts and theories that should (for unknown reasons) be memorized and perhaps even understood in order for one to function as a responsible citizen. Few see science as a way of thinking and questioning and as an approach to learning the secrets of our world. In addition, most children and many adults have a stereotypical view of scientists as studious men in lab coats who spend all their time working alone in dark and smelly chemical or biological laboratories. The Superconducting Super Collider (SSC) totally contradicts such a perception. This great instrument is being created by thousands of scientists, engineers, business people, technicians, administrators, and others, from dozens of nations, working together to realize a shared vision to seek answers to shared questions. The SSCL also provides an opportunity to change the mistaken impressions about science and scientists that have resulted in fewer students pursuing careers in fields related to science. In addition, it will serve as a catalyst to help people understand the roles that scientific thought and inquiry can play in bettering their lives and the lives of their offspring.

Recognizing this problem in our society, the creators of the SSC Laboratory made a commitment to use the SSC to improve science education as well as to seek answers to the most fundamental questions of modern physics. Consequently, in addition to building the world's premier high-energy physics laboratory, the SSCL has a second goal: creation of a "major national and international educational resource." To achieve the latter goal, the Education Office of the SSCL is charged with using the resources of the Laboratory, both during construction and during operation, to improve education in science and mathematics at all levels (pre-kindergarten through post-doctorate) and for all components of our society (including the general public), in the United States and around the world. To accomplish this mission, the Education Office has established four goals and has already begun a wide variety of programs to address them. These goals are to:

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1. stimulate interest and promote understanding in science and encourage scientific thinking, problem solving, and effective communication;
2. encourage participation in science and technology as a career, an avocation, or a general interest;
3. improve the classroom experience for teachers and students; and
4. provide leadership for systemic improvement locally, regionally, throughout the state, and nationally.

These goals and the strategies identified to accomplish them are consistent with the President's National Goals and Objectives for Mathematics and Science and with the priorities established by the Committee on Education and Human Resources (CEHR) of the Federal Coordinating Council for Science, Engineering and Technology (FCCSET).

As with the SSCL itself, the Education Office is currently in a phase of designing and building. Even so, numerous programs are already in operation to meet the demands of the education community. Examples of such programs are described below.

• ***Adopt-A-Magnet Program.*** A curriculum development project designed to introduce to pre-kindergarten through ninth-grade students concepts of magnetism, atomic structure, forces, superconductivity, and other areas of science related to the SSC in ways that will increase their enthusiasm for science and their interest in the world around them. The program uses puppets, games, songs, experiments, and interactive computer software in two-to-three-week supplementary units of hands-on activities to accomplish its goal.

• ***Department of Energy (DOE) National Science Bowl.*** A national science competition designed to encourage and reward academic achievements in mathematics and science by students attending U.S. high schools. DOE national laboratories conduct regional or state science bowls to determine the high-school team that will represent the Laboratory at a national event in Washington, D.C., each spring.

• ***Super Saturday.*** A series of field trips to technological sites (including the SSCL) that stimulate student interest in science and enhance awareness of technological career opportunities by demonstrating scientific concepts and technological applications. The program is offered to Ellis County, Texas, (site of the SSC) high-school students and is funded by the O'Donnell Foundation.

• ***Student Intern Program.*** Provides students with summer projects at the SSC ranging from building particle detector models to muon-ray tracking simulations. Intended to stimulate high school and undergraduate students' interest in science and encourage them to consider careers in science by involving them in educational and work experiences in a high-energy physics research environment. Students also participate in special educational activities.

• ***Contemporary Physics Education Project (CPEP).*** An interactive particle physics project designed to promote science education by stimulating high school and freshman level college students' interest in, and understanding of, the fundamental concepts of particle physics. Program includes interactive curriculum materials, hands-on activities, a computer program, and the Standard Model wall chart.

• ***SSC Technology Projects.*** Two state-funded projects designed to provide technology transfer to faculty and students of Texas community colleges and technical institutes for the facilitation of knowledge and expertise in SSC-related technical areas. The programs are funded by the Texas Higher Education Coordinating Board through a Carl Perkins Grant.

• ***Cooperative Education/Student Research Programs.*** Afford undergraduate and graduate students hands-on work experiences to facilitate integration of classroom studies with practical application in a laboratory environment. Program structure consists of periods of academic study alternating with periods of paid employment in accordance with formal agreements among the students, the home institution, and the Laboratory, as appropriate.

• ***SSC Ph.D. Thesis Program.*** Research opportunities that encourage doctoral students to participate in research related to the mission of the SSCL by offering dissertation topics to students attending U.S. institutions of higher education.

• ***SSC Fellowship Program.*** Provides fellowships to support research at institutions of higher education and other national laboratories to encourage young scientists to participate in research related to the mission of the SSCL and to enhance high-energy physics programs at U.S. universities. Forty-four fellows have been selected to date from the following states: California, Connecticut, Illinois, Iowa, Maryland, Massachusetts, Michigan, Ohio, Oregon, Pennsylvania, New York, Rhode Island, Texas, and Wisconsin. The program is funded by the Texas National Research Laboratory Commission (TNRLC).

• ***Minority College and University Program.*** SSC speakers make presentations at historically black colleges and universities (HBCUs) and other minority campuses to stimulate minority student interest and understanding of the SSCL and related technologies and to motivate and encourage students to pursue scientific disciplines and subsequent careers in science and technology. The program includes Black Executive Exchange Program (BEEP) presentations

• ***Graduate Education for Minorities (GEM).*** A national program that provides summer work opportunities and graduate fellowships for capable minority engineering students to help increase the pool of minority students who receive advanced technical degrees. The fellowships provide tuition, fees, and a $6,000 stipend per academic year.

• ***Student Field Trip Program.*** Laboratory-hosted visits to encourage and stimulate pre-college student interest in and understanding of science and the SSC. Field trip activities may include presentations, tours, make-and-take activities, hands-on-software activities, and demonstrations.

• ***Teacher Workshop Program.*** In-service workshops that offer pre-college educators an opportunity to learn about SSC technology, state-of-the-art science, available science teaching resources, and improved instructional techniques. Each workshop is tailored to the requesting school district's needs.

• ***Detector R & D Research Program.*** Funds detector research at U.S. national laboratories and universities. Institutions in the following states have been awarded funding: Alabama, Arizona, California, Colorado, Connecticut, Florida, Hawaii, Illinois, Indiana, Iowa, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, New Jersey, New Mexico, New York, North Carolina, Oklahoma, Oregon, Pennsylvania, Rhode Island, Tennessee, Texas, Virginia, Washington, and Wisconsin.

• ***Minority Opportunities in Science and Technology (MOST).*** Provides work opportunities at the SSCL to motivate and encourage minority and disadvantaged high-school students to achieve literacy in science and a college degree, and, perhaps, to pursue a career in science. In addition to work experiences at the SSCL, the program offers participants educational opportunities, such as special tutoring and seminars.

• ***Science Education Resource Program.*** A science education resource center that will make SSCL services and resources available to educators at all levels. Through this program, small equipment and science kits will be loaned to schools on a short-term basis to supplement and enhance science courses. Science education resources will also include SSCL staff (using the name "Dr. Quark") available on computer networks such as Kidsnet, TENET (Texas Education Network), and World Classroom to disseminate information about the SSC and to answer science questions.

• ***SSC Student Work/Study Program.*** Student projects at the SSCL designed to stimulate student interest in science and to encourage students to consider careers in science by involving them in educational and work experiences in a high-energy physics research environment. The program will allow students who have participated in an SSC educational program with a fixed duration to continue working at the SSCL while enjoying special education activities. It will also allow unique opportunities for student involvement on projects whose timing or duration is not compatible with existing competitive programs.

• ***SSC Technologist Program.*** Offers hands-on work experiences at the SSCL to community college and technical institute students to facilitate integration of classroom studies with practical application in a laboratory environment. The program will alternate periods of academic study with periods of paid employment.

• ***SSC Research Associate Program.*** Offers research opportunities at the SSCL to educators to revitalize their interest in science and to enhance their understanding of new technologies. Program participants will work with SSCL scientists and engineers on R&D initiatives. The experience will also have a positive impact on the educators' students, who will benefit from their teachers' renewed interest and understanding.

The Education Office will continue to develop programs throughout the SSC's construction period and during the facility's long lifetime of operation. Through programs like those above and through as-yet unimagined programs, the Superconducting Super Collider Laboratory will strive to capture the imaginations of future generations of scientists.