

College Research

www.esf.edu/research

Research at the College of Environmental Science and Forestry is remarkably diverse, current and challenging. Contributions are being made in fields that include aquatic ecosystems, bioenergy, biotechnology, biodiversity, ecology, genetic engineering, nanotechnology, remote sensing, wildlife disease prevention, and many others. ESF is a leader in integrating the energy and excitement of research with the formal requirements of degree and certificate programs. A strong faculty, exceptional field and laboratory facilities, and a positive atmosphere encouraging research combine to make almost limitless opportunities to initiate and to continue research careers. A high percentage of undergraduates and virtually all graduate students participate in research activities as part of their educational experience.

Approximately 89 percent of our faculty is engaged in more than 375 studies that attract support from federal, state, international and non-governmental sources. In 2006, approximately \$13.1 million was spent on externally funded research endeavors, providing not only new results, but also unique educational and experiential opportunities. Research projects engage students of all levels, post-doctoral associates, ESF faculty and external collaborators. These projects extend from sub-molecular to global levels, and many include important innovations and new processes: More than 28 patents have been issued to ESF faculty and their students since 1983.

Our work is often carried out in distant places, including Antarctica, New Zealand, Russia, Africa, Turkey, and South America, and most projects have application far beyond the borders of New York or the United States. Mentoring programs are expanding to enhance the opportunities of new and experienced faculty, staff and students, both in research practice and in identification of the financial underpinnings of research programs. The coming decade is a particularly important time in the College's research experience, as new programs and facilities in biotechnology, bioenergy, natural and environmental sciences are being planned and/or completed.

Specialized Research Units

Adirondack Ecological Center

www.esf.edu/aec

The Adirondack Ecological Center (AEC) is the leader in ecological sciences in the Adirondack Mountains of northern New York and a major contributor to science internationally. Established in 1971, the AEC provides the science that underpins the management of Adirondack Park as one of the world's foremost experiments in conservation and sustainability. It attracts scientists from throughout the world, providing a base of operation for research that seeks to understand the natural ecosystems of the northern forest. Together with top educators, it helps the people of New York preserve and enhance the quality of a wilderness environment while at the same time fostering a vibrant economy. The AEC is located on ESF's Huntington Wildlife Forest, (a 15,000 acre property) in the geographic center of the six-million acre Adirondack Park wilderness. The Huntington is host to the Adirondack Visitors Interpretive Center, which is operated by the Adirondack Park Agency and open to the public throughout the year.

Sixty-five years of research have been incorporated into more than 30 ongoing monitoring efforts. The Adirondack Long-term Ecological Monitoring Program (ALTEMP) monitors more than 100 physical, chemical, and biological attributes to provide the long-term perspective necessary to detect changes and identify trends in the Adirondack ecosystem. The AEC is the site of more than 70 independently funded research programs. These programs represent a broad spectrum of research, from basic to applied, encompassing themes such as the social organization of deer, movement of soil ions, shelterwood silvicultural regimes, and assessing biodiversity across the Adirondack Park. Approximately 150 graduate degrees stem from studies conducted at this site.

Combining modern cafeteria, housing facilities, and meeting rooms with a remote and spectacular wilderness setting, the AEC provides a retreat-like atmosphere for education programs and meetings. Programs can be conducted any time of year and can span days to weeks. Most research, short courses, and meetings are developed by faculty at ESF, but about 30 percent of program activities are conducted by scientists and professionals from other institutions and governmental agencies.

American Chestnut Research and Restoration Center

www.esf.edu/chestnut

The mission of the American Chestnut Research and Restoration Center is to conduct basic and applied research leading to the development of a blight-resistant American chestnut tree and to reintroduce a population of these resistant trees back into forest ecosystems of New York, and then the rest of the eastern United States. The project has evolved from basic research into identification of pathogen-resistance genes and chestnut tissue culture development to include field test plantings of tissue culture derived chestnuts, public participation through identification of rare remnant surviving chestnut trees, collection and exchange of viable nuts and establishment of large restoration plantations throughout New York State. A milestone was achieved in the spring of 2006 when the first four transgenic American chestnut trees were established in the field. These trees will be grown for two to three years and then inoculated to determine their level of resistance to chestnut blight.

Ongoing activities include basic research on various single and pyramided-resistance gene designs, gene transfer into American chestnut trees, greenhouse and field testing of putative-resistant trees, evaluation of environmental impacts of transgenic vs. non-transgenic trees, collection of rare chestnut germplasm, and establishment of germplasm archives throughout New York. The concepts, techniques, and gene cassettes being developed for American chestnut will also have broad applicability in managing diseases affecting the productivity of other important tree species, such as Dutch-elm disease (which devastated another American heritage tree, the American elm) and Septoria leaf spot and canker disease of hybrid poplar (which is becoming a key biomass tree species).

Analytical and Technical Services

www.esf.edu/ats

Analytical and Technical Services (A&TS) was established at the College of Environmental Science and Forestry in the early 1970s. Its mission is to provide specialized, customer-focused, value-added support services contributing to the ESF missions of instruction, research and public service in the following areas: instrumental analytical methods, scientific equipment and instrument repair/design/fabrication, computer repair/

upgrading, and chemical/laboratory apparatus stockroom services. They also maintain the flexibility to develop new services in response to evolving campus needs.

The A&TS team is a technologically diverse collection of skilled professionals who provide an array of centralized analytical and support services for the benefit of ESF and its research partners. Provided services include nuclear magnetic resonance (NMR) spectrometry, gas chromatography/mass spectrometry (GS/MS), liquid chromatography/mass spectrometry (LC/MS), micro-computer repair, instrument and equipment repair and fabrication, inductively coupled plasma-optical emission spectrometry (ICP-OES), chemical and laboratory apparatus stockroom; micromechanical repair and experimental apparatus fabrication, Syracuse University Scientific Glassblowing, and polymer rheology and mechanical properties.

In addition to serving its ESF customer base, the strategic objectives of A&TS also include an "entrepreneurial" mission to enhance interaction with external customers including regional academic institutions (SU, UMU, SUNY campuses at Oswego, Cortland, and Binghamton, Cornell, Hamilton, MIT, Clarkson), governmental agencies and local industries (Bristol-Myers Squibb, Albany Molecular). In this fashion, A&TS positively contributes to the economic development of the CNY region.

Cellulose Research Institute **www.esf.edu/cellulose**

The Cellulose Research Institute's (CRI) mission is to stimulate development and dissemination of new fundamental knowledge about cellulose and related biopolymers, leading to their increased utilization.

The CRI was founded in 1957 in response to an initiative of the cellulose-utilizing chemical industries. CRI members have played major roles in areas such as the physical chemistry of polymers, lignin and wood chemistry, hemicellulose composition and determining the distribution in plant cell walls, the molecular and supramolecular structure of cellulose and related polymers. Several members have received the American Chemical Society's Anselme Payen Award for outstanding cellulose chemistry research. With the recent move into the state-of-the-art Edwin C. Jahn Laboratory, the CRI enters the 21st century with renewed vigor. The addition of 600 MHz solid state NMR, new laboratories for polymer molecular-weight characterization, thermal analysis and molecular modeling offers researchers and collaborators an outstanding facility for long-range academic/industrial research and development.

Some areas of current interest include nondestructive methods of characterizing cellulosic process streams, preparation of cellulose nanocrystals for use in reinforced polymers, bio-conversion of hemicellulose and cellulose into commercially useful biopolymers, and development of novel, environmentally benign cross-linking agents for cellulose. The application of structural chemistry and modeling to understanding fundamental changes in cellulose such as mercerization continues as a CRI focus. Another activity is the offering of a distance-learning course in carbohydrate and polysaccharide chemistry (FCH 540) through the SUNY Learning Network and the development of short courses in aspects of cellulose chemistry.

Center for Native Peoples and the Environment **www.esf.edu/nativepeoples**

Our region is the home of two great intellectual traditions regarding stewardship of the earth: traditional ecological knowledge of

indigenous people and scientific ecological knowledge. The mission of the SUNY-ESF Center for Native Peoples and the Environment is to create programs that draw on the wisdom of both indigenous and scientific knowledge in support of our shared goals of environmental sustainability.

In addition to serving as a bridge between traditional ecological knowledge and western scientific approaches, the Center will incorporate indigenous perspectives and knowledge for the benefit of native students and work to educate mainstream students in a cross-cultural context.

The Center will include a significant outreach element focused on increasing educational opportunities for Native American students in environmental sciences, research collaborations, and partnerships with Native American communities to address local environmental problems.

Center for Community Design Research **www.esf.edu/la/CCDR**

The Center for Community Design Research (CCDR) is an outreach program within SUNY-ESF's Department of Landscape Architecture. Working in partnership with communities, elected officials, agencies, not-for-profit organizations, and other academic programs, the CCDR provides technical assistance, educational programs, and research projects that build community capacity to manage sustainable futures.

The CCDR activities provide educational and research opportunities for community residents, students, faculty, and staff, and promote the design and planning professions through community education, modeling new ways of working, and disseminating research findings.

The mission of the CCDR is:

- To help communities address difficult environmental and social conditions through community-based physical design and planning;
- To develop civic capacity to manage sustainable communities;
- To increase community access to resources and information;
- To identify and investigate critical issues facing communities and offer solutions;
- To foster design literacy and develop public appreciation for the value of design and planning.

The Center works with state, regional, and national organizations and agencies to develop and deliver educational programs and materials. Programs introduce local leaders and community residents to the planning and design process to tackle regionally specific issues and opportunities through hands-on workshop projects. Workshops, training manuals and publications present planning and design issues and concepts in a visual, nontechnical manner. Educational objectives may vary for specific programs; however, they generally address design literacy, leadership development, communication strategies and organizational capacity.

Center for the Urban Environment **www.esf.edu/cue/**

This Center integrates and highlights ecological issues in urban settings. The same principles of systems ecology apply in urban environments as in natural ones, but renewed interest exists in the United States and globally to integrate our understanding of ecological processes as influenced by humans in populated areas.

The Center is dedicated to:

- Investigating and developing novel ways to mitigate urban environmental problems
- Educating and training the next generation of urban environmental scientists, engineers, and planners
- Engaging urban residents in the study and improvement of the urban environment, and
- Working with communities, business, industries, governmental and non-governmental organizations throughout New York State to achieve a more sustainable future.

Central New York Biotechnology Research Center **www.upstate.edu/biocenter**

The biotechnology industry has doubled in the past decade and is widely considered the nation's most promising vehicle for economic growth. Central New York is rich in intellectual capital, ripe for economic revitalization, and proven ground for biotechnology ventures. Central New York is currently home to nearly 3,000 jobs in the biotechnology sector and is poised to expand its reach in this promising arena.

To commercialize their extensive research findings, two cornerstones of CNY's research community, SUNY Upstate Medical University (UMU) and SUNY-ESF, have partnered with the Metropolitan Development Association of Syracuse and Central New York and the Syracuse Veterans Administration Medical Center to create the CNY Biotechnology Research Center (CNY-BRC).

These entrepreneurial SUNY institutions, with a combined force of 300 research investigators, are cultivating private partnerships to nurture biotechnical discoveries with strong commercial potential. SUNY-ESF, with research excellence in natural sciences, and SUNY Upstate Medical University, with research excellence in medicines, share strong commonalities in the biotechnology realm. Both institutions utilize many of the same molecular biology procedures and biotechnology equipment.

With the creation of the CNY-BRC, SUNY-UMU and SUNY-ESF will have access to the high-caliber technology necessary to commercialize biotechnical products and services. A key component of the center will be its world-class core facilities for DNA, proteomic, bioinformatic and tissue-engineering technologies, processes that capitalize on new genomic discoveries and fuel the explosion of the biotechnology industry.

The CNY-BRC, to be built in Syracuse, will include laboratories, greenhouses and business incubation facilities, plus customized classrooms for training the workforce required by this complex industry. Strong economic viability is an essential factor for project incubation in the CNY-BRC. Biotechnology products and services to be selected for research and development must have demonstrated market potential. Also critical is compatibility with the research strengths of SUNY Upstate and SUNY-ESF. Corporate partnership, a key indicator of market viability, is also influential. This confluence of opportunity, expertise and corporate investment dramatically enhances the CNY-BRC's potential for generating jobs and biotechnical ventures.

Council on Biotechnology in Forestry **www.esf.edu/biotech**

Forest biotechnology is a growing field of study that has many potential benefits for humankind and our environment. In addition to the traditional uses of wood products, cellulose from trees is being used as a feedstock to the chemical and

pharmaceutical industries, currently supplementing, but in the future possibly replacing fossil fuels. Biomass from trees will be increasingly utilized as a renewable energy source, as well as a carbon sink to help control global warming. Because many species of forest trees have extensive and perennial root systems, and transpire large amounts of water, they are excellent for use in phytoremediation (i.e. the cleanup of polluted soils). Lastly, trees are keystone species in many environments and are necessary for the maintenance of healthy forests and for restoration of damaged ecosystems. Research into their biology and into ways to use and enhance the unique qualities of tree species is essential to our future.

The mission of the council is to:

- perform cutting edge research that will enhance our understanding of forest tree biology and lead to improved productivity and biodiversity of our forested ecosystems;
- educate and train researchers at the undergraduate, graduate, and postdoctoral levels in the application of molecular biology, biochemistry, and genetic engineering techniques to the study of forest tree species and other organisms relevant to forest productivity, conservation, and ecology;
- enhance collaboration and communication among ESF faculty, staff, and students engaged in forest biotechnology research, other academic and agency researchers, and stakeholders;
- promote the programs in forest biotechnology at ESF across New York State, the nation, and internationally.

Council for Geospatial Modeling and Analysis **www.esf.edu/cgma**

Instruction in geospatial modeling and analysis (GMA) seeks to produce informed, qualified, and professional scientists, managers, decision makers, problem solvers, and designers. A diverse collection of courses and experience provides flexible approaches to learning that ranges from broad knowledge to detailed expertise.

GMA uses an interdisciplinary, problem-solving approach that includes elements of mapping sciences, geography, mathematics, information management, and system analysis. Combined with ESF's world-renowned environmental expertise, GMA generates fundamental knowledge about the world and contributes to more comprehensive management of natural and cultural resources.

GMA research at ESF is developing new ways to collect and use geospatial data. Some of the benefits of using spatial information are the ability to visualize spatial relations, study temporal changes, freeze action in dynamic processes, study global, regional and local processes, and model problems in easily understandable ways. These benefits lead to better understanding and more effective management or decisions. The most common method for exploiting geo-spatial data uses a geographic information system (GIS). A GIS is an automated computer hardware and software system for collecting, storing, retrieving, manipulating, managing, analyzing, and displaying spatial data. GIS is a tool that has broad relevance to environmental science, management, and monitoring, at many scales of analysis. The term geospatial modeling and analysis seeks to recognize this broader context and the integrating nature of spatial approaches.

Collecting, processing, and displaying spatial data has a long tradition at ESF through field work, photointerpretation, photogrammetry, and remote sensing. Powered by an explosion of relatively easy to use geographic information systems,

integration of spatial data is increasingly efficient and effective. With GIS and other technologies, more complex analysis can occur, increasing the applicability and accessibility of GMA. As a result, GMA is integrated into the Departments of Environmental Resources and Forest Engineering, Environmental and Forest Biology, Environmental Studies, Forest and Natural Resources Management, and Landscape Architecture.

Council on Hydrologic Systems Science **www.esf.edu/hss**

The Council on Hydrologic Systems Science conducts research and provides outreach on knowledge essential to the wise ecosystem use and sustained yield of appropriate quality water. The special focus of the Council is biogeohydrologic processes in natural forested systems, including relationships to water supply and waste-water treatment systems. This organized unit also deals with water dependent products of sustainable value in integrated water resource systems.

Having a strong interdisciplinary nature, this Council consists of faculty members from SUNY-ESF and Syracuse University from the following academic units: Chemistry and Environmental Chemistry (ESF), Environmental and Forest Biology (ESF), Environmental Resources and Forest Engineering (ESF), Forest and Natural Resources Management (ESF), Civil and Environmental Engineering (SU), and Earth Sciences (SU). Through the Council, faculty members provide workshops, conferences, publications, consultation, and advising to municipalities, state and federal agencies, corporations, regional watershed advisory groups, technical committees, and professional organizations.

The Council and its members are committed to the development of programs related to water and watershed resources. The presence of the vast diversity of watersheds and instrumentation within the region provides a unique opportunity to understand and quantify the degradation and restoration of watershed resources and services.

ESF offers a variety of degree programs related to watershed resources and is continuously moving forward by adding new faculty and courses to watershed resources related programs. SU provides additional resources particularly in the areas of civil and environmental engineering, earth science and the Maxwell School of Citizenship. ESF and its partner institutions have the capacity to further develop world-class faculty who can offer interdisciplinary opportunities in the area of watershed resources.

Council on McIntire-Stennis Forestry Research

The council coordinates ESF's research through the federal McIntire-Stennis Cooperative Forestry Research program, which provides knowledge essential to the efficient and effective use of the nation's forest resources. Timber production, forest land management, wood utilization, and the associated development of new products and distribution systems are the key elements of forestry research. This research deals with other products of the forest, including wildlife, recreation, water, range and environmental quality, whose production, management and distribution are an inextricable part of the long-term productivity and profitability of the integrated system of forest resources.

In addition, McIntire-Stennis research has the objective of helping to create and maintain a highly qualified cadre of forest scientists through their direct involvement in the research projects as part of their graduate education. These young men and women, educated in the sciences fundamental to forestry, will ultimately

help to maintain the security and well-being of this country through service in private industry, in various levels of government, and in academic institutions as managers and scientists.

Empire State Paper Research Institute **www.esf.edu/pbe/espri.htm**

The Empire State Paper Research Institute (ESPRI) is a leading international research organization in the pulp and paper industry. Established at ESF in 1960, this renowned organization is supported jointly by SUNY-ESF and the Empire State Paper Research Associates, a consortium of leading pulp and paper companies throughout the world.

A model of industry and academic synergy, ESPRI investigates fundamental aspects of pulping, papermaking, and paper physics, including chlorine-free bleaching, properties of papermaking materials, paper structural characteristics, and printability.

The Empire State Paper Research Associates Inc. is a non-profit corporation created to foster fundamental, precompetitive research for the benefit of its member companies and other constituents. The association provides funding for ESPRI and helps steer research projects and communications between the faculty, staff and students of ESPRI and ESPRA members. It is one of the very few associations with international membership and scope fostered toward application of academic research in the forest products industry.

ESPRA partners with ESF to jointly fund the research activities of the ESPRI within the Department of Paper and Bioprocess Engineering (PBE). ESPRI is located in Walters Hall, the home of the PBE faculty on the ESF campus. This building houses a modern pilot plant including two paper machines (PM1 & PM2 48" and 12" trim widths), pressurized 12" disk refiner, batch digesters, well-equipped pulping, bleaching, papermaking and paper testing laboratories. An environmental engineering laboratory and a complete deinking pilot facility are also available.

ESPRI has a worldwide reputation for leading advances in pulping chemistry and lignins, bleaching including non-chlorine based bleach processes, water drainage and fines retention, physics of paper consolidation, moisture effects and diffusion, physics of paper materials, fiber mechanics, paper formation and surface properties. Recently, ESPRI has pioneered the concept of the biorefinery and development of new forest-based materials to provide value prior to pulping of wood.

Office of Environment and Society: Partnerships in Interdisciplinary Research and Teaching (EnSPIRE) **<http://enspire.syr.edu/>**

EnSPIRE began as part of the Academic Plan announced in 2001 by Syracuse University. Recognizing the extraordinary breadth and depth of environmental scholarship on the Syracuse University and ESF campuses, a vision was outlined for gaining national prominence for the two institutions through collaborative research. A committee of faculty and administrators from Syracuse University and SUNY-ESF met for two years to discuss ways to realize that vision. The Office of Environment and Society opened in July 2003 to implement the committee's recommendations.

Tasks to accomplish included:

- developing a directory of faculty at both institutions with scholarly interests in environmental issues, and to put people with related interests in touch with one another;

- supporting (with seed grants, workshop grants, brainstorming and technical support) groups of faculty that wish to develop external grant proposals for interdisciplinary research;
- promoting the visibility of environmental studies on the two campuses, through lectures and other events.

The EnSPIRE committee identified fresh water resources as an example of an important area of strength at the two campuses and a good candidate for pursuing collaborative grants. There are many other areas of strength at the two institutions, and we encourage faculty to think broadly about interdisciplinary environmental research. Topics might include climate change, built environments, biodiversity, urban sprawl, environmental justice, tropical studies, biophysical economics, etc. In addition to scientists, engineers, and public policy specialists, we hope that humanists, social scientists, and design professionals will consider participating in collaborative research and teaching on the environment.

Great Lakes Research Consortium

www.esf.edu/glrc

The Great Lakes Research Consortium is an organization of 18 colleges and universities in New York, with nine affiliate campuses in Ontario, dedicated to collaborative research and education on the Great Lakes. We have nearly 400 member faculty, who are conducting research in every facet of Great Lakes science.

Our mission is to improve the understanding of the Great Lakes ecosystem, including the physical, biological, and chemical processes that shape it, as well as the social and political forces that affect human impact on the lakes and their associated economic resources. We accomplish this through research, instruction, and public service.

The Consortium's goals are to facilitate research and scholarship involving Great Lakes issues, the education of students on topics related to the Great Lakes ecosystem and the dissemination of information gathered through consortium-sponsored research and seminars. The GLRC administers cooperative grants programs, sponsors scholarly workshops and research task forces, coordinates fall and spring seminar series, maintains a database of New York Great Lakes scientific and scholarly work, and publishes a biannual newsletter, a research review and a bimonthly e-mail newsletter.

A student-faculty conference is held each year, providing a forum for students to display their research and affording the opportunity for scientists and scholars to come together to share their ideas and form new collaborations.

Joachim Center for Forest Industry, Economy and Environment

www.esf.edu/joachim/

The Joachim Center focuses on improving the understanding and resolution of environmental problems facing the pulp and paper and related forest industries. The ultimate objective is maintaining a high-quality natural environment and a profitable, vigorous, and competitive industry. The goals of the Center are achieved through four program areas:

Objective intellectual inquiry into the key challenge: contributing to a strong economy by harvesting, processing, and manufacturing timber, a renewable natural resource, into industrial and consumer products and the maintenance of a high-quality living environment.

Development and promotion of a research agenda that focuses on finding effective solutions to the most critical environmental issues facing the forest-based industries.

Advancement of a better understanding by industry of the environmental issues facing the forest products industry, government, environmental organizations, and the public, with the objective of finding beneficial solutions.

Support for resident instruction, research, and public service at ESF to address the complex management and policy issues that have an impact on profits, employment, economic growth, and the natural environment.

Michael M. Szwarc Polymer Research Institute **www.esf.edu/polymer**

The Michael M. Szwarc Polymer Research Institute is a consortium of associate members drawn from several organizations and institutions. It was established to promote the advancement of polymer science through education and research, to coordinate diversified activities of polymer scientists and engineers in the Central New York area, and to develop strong cooperative programs with polymer-based industries nationwide. Among its activities are sponsorship of new educational and research ventures, encouragement of individual and cooperative research programs, participation in academic programs leading to the B.S., M.S. and Ph.D. degrees, and promotion of continuing education and new developmental opportunities for scientists. The Institute will engage in all other activities necessary to maintain itself as a center of excellence in polymer science and engineering.

Polymers are the building blocks of living systems and the early research on cellulose chemistry sparked a substantial growth in research toward synthetic polymers. This, in turn, resulted in the development of many polymeric materials and also stimulated research into the structure and properties of more complex biological macromolecules such as proteins, enzymes, and DNA. The direct outcome of the State University of New York initiative to provide a program in polymer research and education is that many graduates of this program now have leading faculty positions in academic institutions in the United States and abroad or hold important managerial positions in polymer-related industries.

The ever-expanding application of polymer products in recent years means about 70 percent of all chemistry and chemical engineering graduates will be engaged in polymer research and development during their careers.

The Polymer Research Institute comprises faculty members from SUNY-ESF, SUNY Albany, and Syracuse University, as well as members from industry. Members of the Chemistry Department at ESF administer the institute, where an intensive curriculum of polymer science for undergraduate, as well as graduate students (M.S., Ph.D.) is provided. All the students in the polymer program participate actively in the research projects that are interwoven with the academic programs.

NC Brown Center for Ultrastructure Studies **www.esf.edu/cmwpe/ncb.htm**

The N.C. Brown Center for Ultrastructure Studies, located in Walters Hall, is a central microscopy facility that provides teaching, research, and public service. It is equipped to provide students, faculty, and research staff with access to modern microscopy techniques. These techniques include light microscopy, scanning electron microscopy, transmission electron microscopy, video microscopy, digital imaging, and image analysis.

Among the major items of equipment in the center are a JEOL 2000EX 200 KV transmission electron microscope; a JEOL 5800 low-vacuum scanning electron microscope equipped with an EDAX energy dispersive x-ray analyzer; and an array of specialized light microscopes to include: Nomarski DIC, video-enhanced contrast, fluorescence, and a high-resolution digital camera. Ancillary equipment includes high-vacuum evaporators, microtomes, ultramicrotomes, and critical-point driers. The center's resources include specimen preparation rooms, photographic darkrooms, and an image analysis facility.

The primary mission of the center is teaching. Its course offerings include microscopy and image analysis, scanning electron microscopy, transmission electron microscopy, and microtechnique. Research is the second major function and the center provides support to students, research staff, and faculty who are conducting structural studies. Public service is extended to industry and regional colleges, as well as to local high school groups and technology-oriented organizations.

Randolph G. Pack Environmental Institute **www.esf.edu/es/pack.htm**

The purpose of the Randolph G. Pack Environmental Institute is to enhance our ability to create and disseminate knowledge about environmental concerns of high public interest. Reflecting and enlarging our graduate program themes, we particularly seek to advance the state of knowledge about environmental policy and regulation. We focus on how democratic public decisions affecting the natural environment are made, concentrating on topics such as public participation, environmental equity, and sustainable development. The Institute promotes these interests through research and service activity in community, state, national, and international venues.

The institute is located in the Department of Environmental Studies at ESF.

Renewable Materials Institute

The mission of the Renewable Materials Institute is to develop and promote the use of renewable materials, their associated technologies and process engineering. Core studies are on wood and wood-based materials conducted for a variety of sponsors on specific problems. Incorporated under the institute are the Salix Consortium and the Tropical Timber Information Center.

Roosevelt Wild Life Station **www.esf.edu/rwls/**

The Roosevelt Wild Life Station is a partnership of scientists, educators, and public and private sector leaders dedicated to protecting New York's biological heritage and enhancing New York's future through science-based conservation of natural resources. The mission is to help build long-term economic vitality on environmental quality. Activities focus on predicting the impacts of regional and global economic forces on New York's natural resources, communicating this information to the public, and facilitating public policy based on intelligent conservation of those resources.

Research. The goal is to provide new scientific knowledge to find creative solutions to the challenges of developing economic opportunity that is built on a base of environmental quality.

Education/Outreach. The goal is to convey what we learn to the public and foster an understanding and appreciation for conservation issues through short courses and conferences, professional

outreach publications, nature interpretation classes for science teachers, and Web-accessible conservation information.

Policy. The goal is to equip policy makers with science-based tools to make management decisions that will foster economic development while enhancing environmental quality.

The Roosevelt Wild Life Station plays a key role in developing a class of broadly trained conservation professionals. It provides fellowships to graduate students to permit them to engage in cutting-edge research on biodiversity issues under the mentorship of an ESF faculty member; it provides summer internships to undergraduate students to allow them to participate in conservation research under the guidance of a graduate student or faculty member.

President Theodore Roosevelt was an environmental visionary whose name the Roosevelt Wild Life Station honors and whose legacy of natural resource conservation it works to perpetuate.

Salix Consortium **www.esf.edu/willow**

The New York-based Salix Consortium project is a multipartner endeavor to facilitate the commercialization of willow biomass crops as a locally grown, renewable, lignocellulosic, woody feedstock for bioenergy, biofuels and bioproducts in the Northeast and Midwest regions of the United States. In the 1990s, a series of research, large-scale demonstration, and outreach and education efforts were initiated to facilitate the commercialization of willow biomass crops. This included formation of the Salix Consortium. Willows are well-suited for biomass cropping systems because they are easily propagated from cuttings, grow rapidly, coppice vigorously, currently have few pest problems, produce a uniform feedstock and have large potential for genetic improvement over a short time. The ongoing research and large-scale demonstration of willow biomass crops, supported by the DOE, USDA and NYSERDA; developments in the extraction and use of xylan from willow biomass; and the active participation of Consortium partners are creating new opportunities to commercialize the system. A vibrant willow biomass commercial enterprise will bolster the region's farm and forestry sectors, increase energy independence, strengthen the protection of the environment, and mitigate waste and pollution problems.

SUNY Center for Applied Microbiology **www.esf.edu/efb/appmicro/**

The SUNY Center for Applied Microbiology was established in 2004. The Center provides funding for academic research in the broad arena of applied microbiology. The funds are managed through the ESF College Foundation, Inc. and provide support for graduate students, faculty and modest equipment needs.

Current research is directed toward the revival and maintenance of fungal cultures, mostly basidiomycetes. These cultures are also being screened for active laccase producers in conjunction with long-standing interest in the use of laccase for the removal of aromatic pollutants.

Other research continues on biodegradable thermoplastics; the production of hydrogen using photosynthetic bacteria grown on acetate derived from an autohydrolysate of the xylan component of wood; the production of a crystalline compound (not yet identified) which may function as a spore germination inhibitor; and examining fungal cultures as part of an EPA-funded allergy/asthma study.

SUNY Center for Brownfield Studies **sunybrownfields.esf.edu**

The State University of New York (SUNY) Center for Brownfield Studies is an educational initiative focused on environmental management and the redevelopment of brownfield properties. Brownfields are abandoned, idled, or under-used properties where expansion or redevelopment is complicated by real or perceived environmental contamination. The Center focuses on three major areas:

Academic programs to deliver a holistic curriculum that encompasses skills related to remediation and redevelopment;

Community support programs to become the "go to" place for training and advice on state and federal programs for regulation and funding, and technical assistance on remediation, and economic development;

Research and development of innovative processes and technologies for cost-effective, implementable, and protective solutions to protect public health and environment at brownfield sites.

The Center provides undergraduate and graduate students with varied expertise, disciplines, and skills necessary for returning negatively impacted properties to productive use. Both public and private sectors will teach and learn at the Center and contribute to the research that will ultimately enhance society's ability to evaluate, remediate, and redevelop brownfields.

SUNY Center for Sustainable and Renewable Energy **www.esf.edu/energycenter**

The SUNY Chancellor designated ESF as the SUNY Center for Sustainable and Renewable Energy in 2002. This designation marks SUNY-ESF as the systemwide voice for the advancement of biofuels and energy-saving bioproducts, biomass, wind, solar, geothermal and other forms of sustainable and renewable energy.

The center serves as a site for resources and programs for scientific research and draws on the expertise of all ESF departments as well as the research talent throughout the SUNY system and the Syracuse Center of Excellence in Environmental and Energy Systems. ESF's applied research agenda supports the SUNY Center's research from hydrogen storage to lignocellulosic ethanol to gasification to biomass feedstock development. The SUNY Center was an active party in the New York Public Service Commission New York Renewable Portfolio Standard development and hearing process.

Working in concert with the U.S. Departments of Energy and Agriculture, ESF scientists have conducted more than \$20 million in research to maximize the production of woody biomass from salix (willow), develop a sustainable biorefinery based on wood biomass, including the "first of kind" wood-to-ethanol plant, and have conducted both co-firing and gasification demonstration tests.

ESF, working with the New York Power Authority and the New York State Energy Research and Development Authority, is conducting significant fuel cell and fuel cell membrane research and has in-stalled and operates a 250 kw carbonate fuel cell. This project will test the process' ability to provide crucial, distributive, "green" power.

ESF is developing a biodiesel production facility and biofuel refueling station on campus. In addition, ESF's longstanding and proven successful Salix Consortium continues to provide

feedstock for the co-firing, gasification, and manufacture of levulinic acid for biofuels and bioproducts like specialty and commodity biochemicals, biopharmaceuticals and bio-polymers and plastics.

Tropical Timber Information Center **www.esf.edu/cmwpe/ttic.htm**

The Tropical Timber Information Center (TTIC) provides identification of wood samples and information about general characteristics and technical properties of the world's timbers. These services are directed toward the needs of importers and users of tropical woods.

The center, which operates under the auspices of the Department of Construction Management and Wood Products Engineering, was established in 1975 in response to requests from industry for information on tropical woods. It is one of only two such sources of information in the western hemisphere. The center carries out special studies under contract. The technical base for operation of the TTIC is the Department's 35,000-specimen H.P. Brown Memorial Wood Collection of authenticated wood samples and extensive reference materials in its C.H. deZeeuw Memorial library. Both of these resources have been built up over the past 60 years by close cooperation with institutions throughout the world. Primary efforts at the center include responding to requests for services from users of tropical woods, expanding the collection and collecting information on properties and uses of the world's timbers.

U.S. Department of Agriculture Forest Service Cooperative Research Unit

The Northern Research Station of the USDA Forest Service maintains a research center at the college. Since 1978, the Cooperative Research Unit has been conducting research on urban forest effects on environmental quality. The center's efforts provide increased opportunities for faculty and students to collaborate with Forest Service scientists in studies of urban vegetation and environmental problems.