OVERVIEW OF THE COLLEGE

The New York State College of Agriculture and Life Sciences

With more than three thousand students, the New York State College of Agriculture and Life Sciences (CALS) is the second largest undergraduate college at Cornell and the third largest college of its kind in the United States. In national surveys we rank as the best college of agriculture and related sciences in the country. Our faculty and staff, and teaching and research facilities, are among the finest available anywhere, and the college’s educational programs are carefully designed to ensure that every student’s education is geared to contemporary, real-world issues. Through teaching, research, and extension—the three components of our land-grant mission—we strive to improve the nation’s food supply and maintain its safety, to enhance the environment, and to help people improve their lives.

Our mission statement reflects a continuing commitment to people and to the future:

The College of Agriculture and Life Sciences at Cornell University is an educational institution whose mission is to discover, integrate, disseminate, and apply knowledge about agriculture, biological sciences, food systems and nutrition, environment and natural resources, and community and rural development as a basis for sustainable improvement in the lives of people throughout New York State, the nation, and the world.

Our Roots
Agriculture was a major catalyst of the university’s creation in 1865. During the Civil War, federal land grants were given to the states to establish colleges of agriculture. Ezra Cornell and his friend Andrew Dickson White persuaded the New York State legislature to locate the state’s new land-grant university in Ithaca. Cornell, a prosperous farmer, inventor, and businessman, donated a half-million dollars for a new university that would offer education in agriculture, and he contributed his own Ithaca farm for the campus.

The College of Agriculture and Life Sciences has evolved over the past century from the Department of Agriculture (1874), to the College of Agriculture (1888), to the New York State College of Agriculture (1904), to the present New York State College of Agriculture and Life Sciences (1971). These changes reflect our dedication to meeting society’s ever-changing needs.

Originally, the college focused on improving farming practices, with the formation before 1900 of the departments of entomology, agronomy, horticulture, dairy industry, and animal industry. Over the years, CALS departments and programs have established world-recognized teaching, research, and extension programs in agriculture; community, human, and rural development; environment and natural resources; food and nutrition; international programs; and life sciences. We are committed to achieving and maintaining excellence, relevance, and impact in each of these programmatic areas.
Planning for a Prosperous Future

Working with producers, the research, teaching, and extension efforts of the nation's land-grant colleges and universities have made American agriculture the most productive in the world. Today less than 2 percent of the U.S. population (less than 1 percent in New York State) produces enough food to feed all Americans and millions of people in other countries. Food processing, distribution, and retailing employ another 20 percent of New York's workforce. The benefits to the citizens of the state and the nation are far-reaching. In addition to having a diverse, plentiful, nutritious, and safe food supply, the average American household uses only 15 percent of its after-tax income to purchase food, the lowest percentage of any country. This outcome enables greater investment and growth in all other sectors of the economy. Still, agriculture and agricultural producers, as well as consumers, around the world face significant challenges in the next century.

During most of the college's history, agriculture, broadly defined and including related businesses, industries, and communities, has been our primary focus. During the next two decades, we will expand this focus to encompass the food and agriculture system, a theme common to our six programmatic areas that addresses many of the challenges faced by our society. Having this overarching theme will not, however, preclude college faculty and staff from using their considerable talents to address other issues as needs or opportunities arise.

The college is proactively pursuing opportunities and making adjustments that will effectively meet the research, teaching, and extension/outreach needs of the food and agriculture system. The college will continue to be a world leader in agriculture, using a broad food systems approach that integrates the contributions of the biological, physical, and social sciences and incorporates programs once seen as adjuncts, such as the social and environmental sciences, into equivalent roles. Through all of this, we will continue to enhance our current strength in linking departments, disciplines, and colleges to create responsive and effective programs.
MESSAGE FROM THE DEAN

Among the great things about this college are its strong, deep roots, its sense of history, and its commitment to serving society. I'm sure we share many of these characteristics with other colleges of agriculture and life sciences that were created by the historic land-grant legislation of 1862 (Morrill Act). This federal act gave the states land and funds to establish colleges to teach agriculture, the mechanical arts, and other branches of learning that were practical at the time.

In the more than 130 years since Cornell's founding, tremendous changes have occurred in society and in the nation's agriculture and food system. The social sciences are more important than ever before. Communication and information links are highly developed. And our economy is becoming a global one. Over the next fifty years, we will move from an economy based on petrochemicals to one based on biology and information.

A world leader in higher education, the New York State College of Agriculture and Life Sciences (CALS) is dedicated to serving the people of New York State and its agriculture and food industry in an environmentally and socially responsible manner. The college has been and will continue to be an innovator, responsive and willing to adapt to the ever-changing needs of our society. No longer do we teach only the practical art of agriculture. We conduct research, teach, and offer extension programs in the science of agriculture, an interdisciplinary science that requires integrating our knowledge of the biological, physical, and social aspects of agriculture and the life sciences.

In 1997–98, the college made significant progress in several areas. As part of a comprehensive effort to position the college strategically for the new millennium, we have been developing ways effectively to support the college's six major programmatic areas—agriculture; community, human, and rural development; environment and natural resources; food and nutrition; international programs; and life sciences. For example, we used input from many sources, including departments, academic planning councils, and statewide research and extension program committees, to select faculty positions that should be filled to enhance the excellence, relevance, and diversity of our programs.

In fall 1996, after passage of the undergraduate gains policy in spring 1995, which established a broad range of intellectual skills all CALS students should gain from their undergraduate education, we initiated a comprehensive and ongoing academic program review. This review allows faculty, students, alumni, and employers of our students to suggest changes that will improve our undergraduate educational programs and set future directions for the college.

Finally, knowing that we are on the verge of a biological revolution, in November 1997 a task force began developing a campuswide plan for genomics at Cornell with a long-term vision for biological, agricultural, engineering, and medical research. CALS provided leadership for the task force and has become an active partner in the Cornell Genomics Initiative.

Covering the years 1997 and 1998, this biennial report highlights a sampling of our far-reaching accomplishments across the college's six major programmatic areas. After reading the report, I think you'll agree that the college's evolution has served to strengthen our commitment and capacity to carry out the threefold land-grant mission—teaching, research, and extension/outreach. Today's New York State College of Agriculture and Life Sciences continues to improve the quality of life and economic well-being of the citizens of the state, the nation, and the world.
AGRICULTURE

Coming to a Plate Near You: New Fruits and Vegetables from CALS

At the annual New York State Vegetable Conference and Berry Growers Meeting in February 1998, Cornell plant breeders released six new varieties of fruits and vegetables.

Two new red raspberries bred by John Sanford, associate professor of horticulture, and Kevin Maloney, research support specialist, are a boon to both growers and consumers. “Prelude ripens early and Encore ripens late,” says Maloney, describing the varieties. “Extending the season in both directions allows growers to get the premium first and last fruit prices and lets New York consumers eat locally produced berries from June through September, rather than those shipped in, which are not as fresh.”

A new Caserta-type summer squash called Whitaker and a new Ithaca-type head lettuce called Onondaga were also released. “Both of these varieties are remarkable for their disease resistance that is derived from wild species,” says Richard Robinson, the professor of vegetable breeding who worked with research support specialist Joseph Shail to develop the new varieties.

Two new potato varieties were developed by Robert Plaisted, an emeritus professor of plant breeding and a highly respected potato breeder. “Salem is an early-emerging, mid-season potato with high-yielding ability, bred for table stock,” says Plaisted. “Reba is a mid- to late-season potato bred for both the potato chip market and table use.” One hallmark of Plaisted’s contributions to the New York potato industry is the golden nematode resistance found in all his releases. This pest, unique in this country to New York State, can significantly limit yield and marketing of the crop and is most efficiently controlled using environmentally safe plant resistance.

CALS Plays Important Role in Agricultural Environmental Management Program

The NYS College of Agriculture and Life Sciences (CALS) and Cornell Cooperative Extension (CCE) play important roles in the Agricultural Environmental Management (AEM) Program—New York’s multiagency response to federal clean water legislation and public concerns about the environmental impacts of farming practices.

A sampling of the history and accomplishments of the NYS College of Agriculture and Life Sciences, Cornell University

1800s

1865 – Cornell University is founded by Ezra Cornell, who donates his farm for part of the campus.

1868 – Cornell University opens with thirty students enrolled in agriculture.
Across the state, CCE education and outreach programs help farmers implement nutrient and pesticide management practices that can enhance farm profitability while minimizing nutrient leaching and runoff. Barbara Bellows, the AEM outreach coordinator and extension associate, develops informational materials about the program, writes and edits articles for publication in the agricultural and general press, and produces detailed information sheets on critical farm environmental practices.

Peter Wright and Lee Telega, senior extension associates with Cornell's PRO-DAIRY program, are actively reaching out to dairy farmers, informing them about upcoming regulations and helping them to identify and implement appropriate management practices to achieve compliance. Wright and Telega also serve on the AEM certification and technical committees that design training materials and technical guidelines for certification of the agency and private sector personnel who will develop environmental plans.

CALS's partners in the AEM program include the New York State Departments of Agriculture and Markets, State, Health, and Environmental Conservation, the Soil and Water Conservation Districts, the Natural Resources Conservation Service, and the Farm Service Agency.

Other New Varieties from CALS

Department of Plant Breeding faculty, such as Margaret Kyle Jahn, have released new strains of squash, pumpkin, cucumber, and melons that resist virus diseases. Such resistance will help individual growers save thousands of dollars annually, adding up to more than $1 million for New York growers and up to $50 million for farmers nationally. For consumers this resistance will help assure ample supplies of these vegetables at reasonable prices.

Steven Slack, professor of plant pathology, produces pathogen-tested, disease-free, nuclear-class seed potatoes for the New York State seed potato industry. Nearly 98 percent of all New York seed stocks come from this Cornell University potato program, which ensures that they are free from infectious viruses, bacteria, and fungi known to cause or carry serious diseases such as leaf roll and potato late blight.

Donald Viands, professor of plant breeding, has developed eleven alfalfa varieties featuring disease resistance to Verticillium, Fusarium, and bacterial wilts; Phytophthora root rot; and anthracnose stem blight. The newest variety, released in 1998, also has high feed quality traits and the highest forage yield potential of any previous Cornell release.
Research Findings to Help Farmers Fight Pests

College scientists are continuing their long tradition of groundbreaking research into the mysteries of plant cell activity. Mandayam Parthasarathy, a biology professor, studies how the "muscle proteins" that make up a cell's cytoskeleton move organelles (specialized cellular parts) from one place to another within a cell. He is also investigating whether these same proteins play a role in the signaling mechanism cells use to warn each other of the presence of pathogens.

Plant pathology professor Alan Collmer and other plant scientists are trying to understand the messages that trigger cellular suicide—a kind of plant defense against the assault of pathogens—and the mechanism that delivers these messages. They have discovered that bacteria actually deliver proteins into plant cells and that pathogen recognition takes place inside the cell rather than on the cell surface.

Terrence Delaney, assistant professor of plant pathology, is looking for the plant genes that are involved in the signaling pathway of systemic acquired resistance (SAR)—a slower response to pathogens that provides immunity to the entire plant. One chemical event accompanying SAR is the accumulation of salicylic acid, the active ingredient in aspirin. Delaney has discovered a gene that allows plants to respond to salicylic acid. This research could lead to methods—either applying substances that mimic the effects of salicylic acid to stimulate SAR or engineering the genes that regulate this process—to battle crop pathogens and reduce the need for pesticides.

Fundamental research on plant-bacterial interactions by plant pathology professor Steven Beer, Collmer, Delaney, and research associate Zhongmin Wei has already resulted in isolation of a plant protein, harpin, that holds great commercial promise as a substitute for pesticides. Spraying harpin on plants elicits resistance to pathogens; it also elicits SAR, enhances plant growth, and causes repellency to insects.

The Cornell Research Foundation, working with Beer and his colleagues, has filed several patent applications for the commercial use of harpin and related materials and has licensed the harpin technology to a biotechnology firm, Eden Bioscience Corporation, in Bothell, Washington.

1888 – Liberty Hyde Bailey is recruited to Cornell as professor of horticulture. He later wills his collection of papers, including a copy of Gregor Mendel's original paper on the laws of inheritance in garden peas, to Cornell.
Optimizing Animal Nutrition
Many of the successes dairy farmers and meat producers have enjoyed over the last half century can be attributed to improvements in animal nutrition. For the first time, feed requirements can be predicted for each production setting, thereby reducing overfeeding of nutrients, increasing efficiency of nutrient use, maximizing performance, and reducing nutrient excretion.

The Cornell Net Carbohydrate and Protein System, developed by a team of animal scientists including Danny Fox, professor of animal science, was used to develop feeding standards for the National Research Council's seventh revised edition of Nutrient Requirements of Beef Cattle. With more than 90 million beef cattle being fed annually in the United States, the conservative estimated benefit to producers ranges from $500 million to $1 billion each year.

Excess nutrients that reach the environment through animal waste pollute the soil and water, unnecessarily increasing farmers' costs. Animal science professors Danny Fox, Dale Bauman, Alice Pell, and Xingen Lei have developed the Cornell Nutrient Management Planning System, three computer software programs that help farmers manage nutrient intake, grow the proper crops to meet the needs of their animals, and develop a nutrient management plan based on the proper application of manure nutrients. The software will be available to consultants and planners who work with farmers, as well as to Cornell Cooperative Extension educators.

Danny Fox and Alice Pell are designing animal nutrient plans that keep dairy farms profitable and competitive, while protecting the environment.

1898 – Anna Boteford Comstock, Class of 1895, is appointed assistant professor and becomes the first woman to join the Cornell faculty. She will become a full professor in 1920.
Forecasts Give Farmers a Jump on Pests

Farmers in the Northeast have a new way to stay ahead of fungi, bacteria, insects, and other pests that threaten their crops. Cornell integrated pest management (IPM) specialists and cooperating growers throughout the Northeast now provide daily, proprietary pest forecasts as part of the Northeast Weather Association (NEWA).

Here’s how it works: NEWA is a consortium of growers who have installed small weather stations on their land. Each day information such as the temperature, relative humidity, leaf wetness, and precipitation is transmitted from the farm to the IPM computer at the NYS Agricultural Experiment Station in Geneva.

In its first year more than fifty growers joined the association. John Gibbons, NEWA’s project coordinator, maintains the weather stations in the farmers’ fields and orchards, ensuring flow of information to the computer in Geneva. Cheryl TenEyck, NEWA’s systems analyst, looks after the various pest forecasting computer programs. Tim Weigle, IPM coordinator for grapes in western New York, and Curt Petzoldt, IPM coordinator for vegetables and assistant director of the NYS IPM Program, work with the region’s grape and vegetable growers, respectively.

1900s

1903 - Liberty Hyde Bailey is appointed dean of the college.

1904 - The College of Agriculture becomes the New York State College of Agriculture at Roberts Hall.

1906 - The college enrolls 145 regular students, 133 two-year students, 36 graduate students, and 244 winter students.
PRO-DAIRY Program Makes Dollars Out of Management Sense

Through its innovative extension education curriculum the PRO-DAIRY program increases the profitability and competitiveness of the New York State dairy industry and, in turn, economic development throughout the state. The program's "to do" books focus on forage production, milk quality, environmental awareness, as well as the management of feeding, reproduction, grazing, and farm finances.

The 5,000 participant farmers account for more than 52 percent of the milk produced in New York State. Since its inception in 1988, the program's dairy business and marketing strategies have led to documented savings of $52 per hundredweight of milk and an additional output of 184 pounds of milk per cow annually. This adds up to $11,000 of extra income for a farm with a relatively small (101-cow) herd.

Dairy Management Fellow Program: Lessons from Academia and Industry

The Dairy Management Fellow program, designed in 1983 by Dave Galton, professor of animal science, provides special opportunities and experiences for a select group of juniors and seniors with a sincere interest in the dairy industry.

This three-semester program teaches lessons from both academia and industry. Course work in dairy management and agricultural economics is combined with hands-on analysis of operating New York dairy farms. Students also participate in educational seminars and visit farm cooperative boards of directors, feed companies, the New York State Department of Agriculture and Markets, and state government officials. Every summer twenty-five to forty-five students intern on farms across the country. And six students participate in an exchange program with California Polytechnic State University, where they learn and experience methods of dairying—such as California flat barns—seldom practiced in the East.

1907 - Herbert J. Webber becomes the first tenure-track faculty member in the College of Agriculture.

1908 - The Laboratory of Plant Breeding is established with thirteen graduate students and $600 for research.
New York FarmNet Serves the Farm Community

New York FarmNet, directed by professor of agricultural, resource, and managerial economics George Conneman and extension associate Cathleen Martin Sheils, is a statewide information and outreach program that cuts through the red tape to help farm families manage their farm and business finances. The program reaches people through phone calls, on-farm consultations, and the educational and referral work of county Cooperative Extension associations.

FarmNet was there for families affected by the January 1998 ice storm in northern New York. Sheils and her staff worked on-site to train the mental health counselors provided by the Federal Emergency Management Agency (FEMA) after the area was declared a federal disaster. In addition, from mid-January through March, FarmNet consultants held one-day workshops in Franklin, Jefferson, and St. Lawrence Counties for groups of agriservice professionals—veterinarians, loan officers, feed distributors, and the like—on ways to recognize customers suffering from stress and how best to communicate with them.

FarmNet also supported relief efforts by responding to hundreds of calls on their 800 number hotline, developing a

1910s

1913 – The New York legislature passes the first act supporting extension work, appropriating $25,000 to organize and support county associations.

1914 – The federal Smith-Lever Act provides federal financial support for cooperative extension systems in each state.

Enrollment reaches 1,544 for four-year students and 395 for graduate students.
registry of farm labor relief, and working with milk cooperatives and other agricultural creditors to develop long-term credit and recovery plans.

Cornell Community and Rural Development Institute Presents Its Annual Innovator Awards
Each year the Cornell Community and Rural Development Institute (CaRDI) presents Innovator Awards to successful collaborative programs in New York State that clearly contribute to community and rural development. The award-winning programs for 1997 and 1998 included the following:

- The Cornell Program on Environmental Conflict Management (CPECM) was established in 1994 as a forum for the exchange of ideas on collaborative ways to resolve multiparty environmental, community development, and public policy disputes. CPECM, a component of the Cornell Center for the Environment, acts as a clearinghouse for people seeking ways to address complex multiparty conflicts with broad policy implications. The program works in three geographic areas—the northeastern United States, Central America, and Southeast Asia—and deals with a wide range of issues that include watershed and protected areas management, agricultural and rural development policy, and community planning and development.

- The Community Plant Food Project, directed by nutrition professor Ardyth Gillespie, strives to improve community and family health through better food decisions and stronger community food systems. In partnership with community groups in Rochester, N.Y., this project is working to enhance access to food for all and to generate economic development and vitality in low-income neighborhoods by bringing food outlets back into these neighborhoods.

- The New Farmers New Markets Program is an economic development education program initiated in 1994 by Cornell Cooperative Extension (CCE)—New York City, in cooperation with CCE–Dutchess County; Cornell’s Farming Alternatives Program; and local, urban, and rural not-for-profit groups. This program seeks to rebuild the regional farm market system, thereby generating sustainable jobs and promoting community-based economic development.

1920s

1917 – Cornell awards Earl A. White what is believed to be the nation’s first Ph.D. degree in agricultural engineering.

1918 – The Alumni Association has 500 members; 150 are active.

1924 – 1,641 students are enrolled in the college; 505 are women, most enrolled in the college’s School of Home Economics.

1925 – The School of Home Economics is established as a separate entity, the New York State College of Home Economics.
Student-Centered Technologies Improve Teaching and Learning

Geri Gay, an associate professor of communication, founded the Human-Computer Interaction Group in 1985 to study computer-mediated communication. The group has teamed up with the New Lab at the Dalton School in New York City to help schools establish a basic level of “information literacy” for their pupils. Their in-depth ethnographic study of the use of technology at Dalton examines ways students and teachers adapt and shape the technologies available to them.

At the same time, the group is helping the Dalton School improve the integration of technology within its curriculum. These efforts focus on new tools to aid in the selection and use of multimedia materials; collaborative virtual classroom and library environments that connect educators, students, and professionals; and innovative access methods, such as the use of mobile, hand-held computers or wireless technologies.

“What we’re trying to get at is how human beings interact with computers,” Gay says. “We’re looking at principles that have sustained human communities for thousands of years and asking how these new technologies help, or hurt, them.”

- Small-Scale Food Processing and Sustainable Agriculture, a project developed by Gilbert Gillespie, Jr., senior research associate in rural sociology, and Duncan Hilchey, senior extension associate in Cornell’s Farming Alternatives Program, addresses problems unique to small-scale food processors in New York State. Small-scale food processing has become a strategy for farmers to capture more of the consumer dollar and enhance employment opportunities. But it has also resulted in special problems for farmers, such as having to order supplies in small quantities, obtaining business liability insurance, and not having a voice at the table during regulatory developments. Working with an association of farmer-processors, this program helps find solutions to these problems.

Farming Alternatives Program Fosters Agricultural Sustainability
The Farming Alternatives Program (FAP), directed by rural sociology professor Thomas Lyson, has pioneered the concept and practice of “agriculture development,” fostering community and economic development by linking local farms to emerging market opportunities. Recently, FAP initiated a long-term project to link the special needs of ethnic markets in New York

1926 – James B. Sumner discovers the first enzyme, an accomplishment that will win him a Nobel Prize.

1927 – The college’s first endowed professorship, the Charles L. Pack Professorship in Forest Soils (agronomy), is established.
City with growers in outlying areas.

The program originated the idea of NY Farms!, a statewide consortium of more than fifty organizations, ranging from Church Women United to commodity groups such as the National Grape Co-Operative, to environmental organizations such as the New York Audubon Society. Judy Green, FAP program coordinator, assists the members of NY Farms! with local projects that foster consumer loyalty and boost the demand for New York’s agricultural products.

**High School Teachers Improve Science Education**

For six years, the Institute on Science and the Environment for Teachers (ISET), a joint project of the Department of Education and the Cornell Center for the Environment, has brought secondary school science teachers to Cornell to study water quality issues and watershed dynamics. William Carlsen, associate professor of science education, is the principal investigator for ISET.

During a three-week residential summer program, teachers learn laboratory and field techniques for monitoring stream ecosystems; learn to interpret aerial photographs; use computers and physical models to study biological, chemical, and hydrological aspects of watersheds; and develop strategies for problem solving, original experimental design, and authentic assessment in classrooms. Participants return to their home schools with new knowledge, computer software, and scientific supplies to use in their own teaching projects. During the school year, they stay in touch with one another and with ISET staff through Saturday workshops, school visits, and a dial-in computer network.

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**ARME 425: Students Learn Applied Management Skills Through Practical Experience**

How do students simultaneously earn academic credit and get hands-on professional experience? Through the course “Personal Enterprise and Small Business Management” (ARME 425), taught by Deborah Streeter, associate professor of agricultural, resource, and managerial economics.

Students work in teams to address key issues for small local companies. For example, they developed marketing plans for custom-made clubs at Precision Golf Center and concocted strategies to lure out-of-town visitors to the Ithaca-based Sciencenter. For downtown’s Café Dewitt, students created a pricing strategy for the business’s new catering service. For Locke Woods Interiors, a group developed a five-year expansion plan. And that’s only a sampling of their contributions.

Students complete projects through meetings with the business owner, consultations with instructors, attendance at weekly workshops with invited experts, and research and analysis. The skills they learn are valuable in a variety of career settings—running a small business, working in the consulting industry, or managing a specific area within a large company.

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**1930s**

Rollins A. Emerson, professor of plant breeding, releases selectively bred varieties of dried beans, celery, and muskmelon.

Leo Norris discovers that vitamin B is a complex rather than a single vitamin.

1931 – Clive M. McCay develops an enriched bread formula to reduce deficiencies of calcium and other nutrients in the diets of Americans.
Environment and Natural Resources

Protecting New York City's Water Supply
New York City's drinking water rushes through a 100-mile-long pipeline originating in the Catskill Mountains. The NYS College of Agriculture and Life Sciences is working with farmers in the upstate watershed to keep this vital water supply safe for the approximately 8 million city and 1 million Westchester, Ulster, and Orange County residents. Supporting this effort, which began in 1990 as the Watershed Agricultural Program, are the New York State Water Resources Institute and four faculty teams offering a multidisciplinary approach to the many issues that must be addressed.

With assistance from the college, the Watershed Agricultural Program is helping farmers adopt fertilization and livestock handling practices that will minimize the runoff of nutrients and pathogens from farms into the watershed. In addition, the program works with farmers to develop profitable niche markets in the city.

Max Pieffer and J. Mayone Stykos, professors of rural sociology, surveyed more than 2,500 state and city residents to learn more about the food preferences of urban consumers and to inform future promotional campaigns designed to encourage urban dwellers to purchase products from farms in the watershed. In this way, both farm profitability and the quality of the city's drinking water will be improved.

1940s

1939 - G. W. Salisbury initiates a significant research program in animal breeding and artificial insemination.

Analytical methods for testing the physical and chemical properties of milk and milk products are developed. Cornell researchers develop a de-aeration process and refine equipment to remove “off” flavors from milk.
A Model for Protecting Watersheds Nationwide

Even as New York City’s Watershed Agricultural Program attracts attention as a national model, college faculty and staff are expanding their efforts to protect watersheds across New York State and beyond.

Cornell Cooperative Extension of Onondaga County, along with its agency partners—the Natural Resources Conservation Service, the Soil and Water Conservation District, and a farmers’ Ad Hoc Task Force—work with farmers in the Skaneateles Lake watershed who were concerned about the possible impacts if the city of Syracuse implemented a comprehensive watershed protection plan. CCE–Onondaga County endorsed a voluntary protection program for farmers in the watershed. Program staff produced and implemented Whole Farm Plans for participating farmers and developed a farm business management program for the Skaneateles Lake Watershed Agricultural Program.

Rebecca Schneider, assistant professor of natural resources; Deborah Grantham, extension associate in soil, crop, and atmospheric sciences; and Peter Smallidge, senior extension forester, developed Stand by Your Stream (SBYS), a program to increase awareness of the importance and value of healthy streamside and promote good management practices. Program resources and activities are available to environmental and water resource professionals, extension educators, rural landowners, farmers, town planners, municipal government officials, and youth groups. Resources include a newsletter and fact sheets, satellite video broadcasts, regional landowner workshops, in-service training sessions, consultations with municipal governments, and lectures to high school classes about streamside protection.

1946 – James B. Sumner, professor of biochemistry and nutrition, wins the Nobel Prize in Chemistry for demonstrating that enzymes are proteins.

1948 – The college’s first Professor of Merit Award is presented to Stanley W. Warren, who in the course of his career will teach farm management for forty consecutive years, by Ho-Nun-De-Kah, the student honor society.
Educating the Public on Breast Cancer and Environmental Factors
The Cornell Program on Breast Cancer and Environmental Risk Factors (BCERF) was created in 1995 in response to growing public concern about elevated breast cancer rates in certain counties in New York State. BCERF’s Web site at www.cfe.cornell.edu/berf translates scientific findings and data into understandable and accessible information. In addition, it has initiated local efforts to use what is known about breast cancer risk factors to create risk reduction strategies for women and girls.

The program is directed by June Fessenden MacDonald, associate professor of biochemistry and biology and society, and involves college and university specialists in the fields of comparative and environmental toxicology, nutrition, food safety, risk communication, pesticide education and management, public policy, and consumer education. Through satellite video teleconferences, regional workshops, and fact sheets, BCERF has provided information about the links between environmental risk factors and breast cancer to more than 500 extension educators, health professionals, and breast cancer activists from more than forty counties in New York State and the region.

Food Scrap Composting for Restaurants
Many communities in New York State are seeking alternative waste handling methods to meet state and municipal waste recycling goals and obtain benefits from their organic wastes. Composting of food scraps and other organic residuals is part of the answer. A survey conducted by the Cornell Waste Management Institute identified more than 275 composting facilities in New York State. Maps and a database can be viewed on the Web at www.cfe.cornell.edu/wmi/.

With technical assistance from the Cornell Waste Management Institute and its director Ellen Harrison and extension associate Jean Bonhotal, increasing numbers of New York businesses and institutions are diverting organic material from the waste stream. Other institute research helped develop composting systems for municipal-level collections of yard waste, commercial and recreational fishing, cattle bedding, and sewage plant sludge.

A project conducted by food science professor Joseph Regenstein examines current small-scale, on-site composting procedures of food waste generators. The program also evaluates the equipment currently available for composting to see whether it is practically, technically, and economically feasible for operation in urban environments such as New York City.

1950s

Robert Smock develops controlled atmospheric storage techniques to maintain apple quality.

Agricultural economist A. Batton and animal scientist R. Foote conduct pioneering work that boosts bull semen preservation and fertility.

1950 - The college has 1,776 students—it's largest undergraduate enrollment since World War II.

1952 - Mann Library opens. It is second in size only to the National Agricultural Library.
Penningroth Receives Environmental Excellence Award
Stephen Penningroth, senior research associate in the Institute for Comparative and Environmental Toxicology, Cornell Center for the Environment, received the Edison (N.J.) Wetlands Association's highest award for environmental excellence.

Penningroth was honored at a 1998 gala in Edison for his contributions over the last seven years to cleaning up a contaminated site in Edison that includes the Raritan River Estuary. Working with the Edison Wetlands Association, the Environmental Protection Agency, the Edison Health Department, and the New Jersey Department of Environmental Protection, Penningroth interpreted data, reviewed technical reports, and helped design innovative methods for washing contaminants from the soil.

Human Dimensions Research Unit Fosters Resolution of Natural Resource Management Issues
Established in the early 1970s, the Human Dimensions Research Unit (HDRU) of the Department of Natural Resources helps natural resource agencies understand their diverse stakeholders and design ways to involve citizens in resolving natural resource management issues. Daniel Decker, professor of natural resources and co-leader of HDRU, and other HDRU members conduct research on the human behavioral aspects of natural resource management policy, including wildlife management.

Barbara Knuth, associate professor of natural resources and HDRU co-leader, and Bruce Lauber, research associate, examine how citizens reason through controversial wildlife management issues, such as the causes of the increased number of goose-related complaints and the suitability of different management approaches in Rockland County, located north of New York City.

Tommy Brown, senior research associate in the Department of Natural Resources and leader of the HDRU, has been working for more than twenty-five years on the issue of access to private land by recreationists. According to Brown, it is important that policymakers, recreationists, and landowners know the reasons for posting, how posting affects access, and how access affects wildlife management on private lands.
Entomology 471: Measuring Recovery in the Cayuga Inlet after 1997 Diesel Fuel Spill

During spring 1998, undergraduate students in entomology professor Barbara Peckarsky's “Freshwater Invertebrate Biology” class (Entomology 471) trooped out to the headwaters of Cayuga Inlet, a tributary of Cayuga Lake and the site of a November 1997 train derailment and 7,000-gallon diesel fuel spill. The inlet, one of the premier fishing streams in the area, is home to naturally breeding rainbow trout. Within days of the spill 92 percent of the fish were dead. So were 90 percent of the aquatic insects upon which they feed.

To measure recovery, class members helped collect samples of stream invertebrates at multiple sites around the spill. They spent many of their lab sessions sorting and identifying the contents of these samples.

Now, not only does Peckarsky have data on the condition of the aquatic insect community immediately after the spill, she also has data collected 3 months, 1 year, and 15 months later. While on the surface the stream looks and smells fine, the most recent findings are disturbing. Although the total number of insects is nearly back to normal, the species diversity is only half of that found in reference tributaries located above the spill.

These results will help the New York State Department of Environmental Conservation and the U.S. Fish and Wildlife Service as they continue to investigate and rectify the effects of the spill.

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1960s


1963 – The Program in International Agriculture is established.

1964 – The Division of Biological Sciences is organized to “chart the course of basic biology at Cornell . . .”
FOOD AND NUTRITION

CALS Researchers Are Watching Over the Food Supply

The emergence of “superbacteria,” more meals being served away from home, and the globalization of the food system have heightened concerns about the safety of the U.S. food supply. College scientists are investigating new pathogens and developing tests to detect them earlier, as well as teaching food workers how to prevent contamination.

Thanks to the efforts of Kathryn Boor, assistant professor of microbiology and director of the Department of Food Science’s Food Safety Laboratory, the nation’s food supply is becoming safer. Boor’s laboratory uses genetic fingerprints to identify bacteria that cause food-borne illness and food spoilage (see box at right). She and her colleagues regularly work with the New York State Departments of Agriculture and Markets and Health and the national Centers for Disease Control to link far-flung instances of illness caused by tainted food to their source and to improve food product quality and safety. In addition, two major findings from Boor’s research—that bacteria in the real world change constantly compared to their relatively immutable laboratory brothers and that two very different bacteria respond to stress factors in a similar way—have shattered long-held assumptions in food science.

Carl Batt, professor of food science, recently collaborated with Harold Craighead, professor of applied and engineering physics, to produce biosensors that detect harmful bacteria such as E. coli. Using Cornell’s nanofabrication facility, the researchers developed miniature detection devices that can instantly indicate the level of bacterial contamination in food.

The FDA and the USDA’s Food Safety and Inspection Service have embraced Hazard Analysis and Critical Control Points (HACCP), a new approach to food safety control in which food processors and producers identify and anticipate potential food safety hazards and apply science-based controls to prevent these hazards.

Robert Gravani, professor of food science, has conducted HACCP workshops for meat, poultry, and seafood processors and developed a proposal that would help small food processors in New York State initiate HACCP plans.

Researcher and Database Are Credited for Saving Lives in Outbreak of Deadly Pathogen

The persistence of Martin Wiedmann, a food science researcher, and the prompt use of the Food Safety Laboratory’s unique bacterial fingerprint database are credited with limiting the death toll in a recent outbreak involving a virulent strain of Listeria monocytogenes.

For the past seven years, Wiedmann has collected samples of this bacterium, identified each strain’s unique genetic fingerprint, and developed a fingerprint database that currently has nearly 800 strains. Using the Listeria database, Wiedmann identified strains of Listeria in samples and helped the Centers for Disease Control in Atlanta determine the cause of an outbreak of the food-borne illness that killed twenty-one people nationally.

“I wonder if the outbreak could have been recognized so quickly or even if it would have been recognized at all,” says Dale Morse, director of the Division of Infectious Diseases at the New York State Department of Health. “Because of Martin’s effort, we were able to link seven cases together early, clarify that there was an outbreak of a certain strain, and identify it and where it came from early. Without this effort, the strain may never have been identified.”

1965 – Wendell L. Roelofs begins research on insect pheromones (sex attractants), which leads to the development of microchemical techniques for the isolation and identification of pheromone components in more than fifty insect species. He will later receive the Wolf Foundation Prize in Agriculture (1983) and the National Medal of Science (1985).

1966 – The Empire apple is introduced by the agricultural experiment station at Geneva.

1968 – Robert William Holley PhD ’47 wins the Nobel Prize for Medicine and Physiology.
Improving Processed Food with Supercritical Fluid Extrusion
Food science professors Syed Rizvi and Steven Mulvaney have developed a patented technology—called supercritical fluid extrusion (SCFX)—that could significantly benefit the processed food industry.
SCFX is the convergence of two technologies: extrusion and supercritical fluid. With SCFX, the puffing of snack food, pasta, bread, and cereal is performed by adding a so-called supercritical fluid, which is part liquid and part gas, such as carbon dioxide. The new technology gives food processors the ability to control the composition of snack food and prevent products like cereal from becoming soggy too quickly, while retaining their taste and crunch. It could also revolutionize the ready-to-bake bread industry, replacing baking soda or yeast for leavening, and shorten cooking times for pasta, while maintaining the same texture.

1970s

1970 – Nineteen percent of the college’s students are women.

1971 – The college’s name is changed from New York State College of Agriculture to College of Agriculture and Life Sciences.

1972 – The Liberty Hyde Bailey Professorships are established to recognize outstanding faculty who have national and international reputations in agriculture and related sciences.
Safe Cider Workshop Held at Geneva Experiment Station

In March 1997, more than 130 apple cider makers from seven states and Canada attended a workshop on cider processing and safety at the NYS Agricultural Experiment Station in Geneva. The workshop was organized in response to an instance of food-borne illness caused by *Escherichia coli*-contaminated apple juice products. College faculty and staff and state officials discussed the details of the incident and outlined requirements and recommendations for the production of cider without risk of contamination.

In addition to more prudent harvest and orchard management practices to reduce the chance of *E. coli* contamination, Mark McLellan, chairman of the Department of Food Science and Technology at Geneva, and others proposed that producers develop a detailed risk management plan and implement a hazard analysis critical control point (HACCP) plan. Judy Anderson, from the NYS Food Venture Center at Cornell, outlined the steps involved in such a plan for cider producers to identify, monitor, and remove possible hazards. The use of “hazard” plans is federally mandated in the meat, poultry, and seafood industries.

Cornell Students Win National Food Product Competition for Third Time

The Cornell University Food Product Development Team won the 1998 Institute of Food Technologists’ national food product competition in Atlanta for the third time in four years. The winning entry was a cone-shaped, flour tortilla meal wrapper called Wrapidos.

“We would market this toward busy families with small children,” says Henry Cortez, then senior and chair of the food science student team. “It is a preformed tortilla shell sealed at one end with a moisture barrier to help prevent leakage. Meal preparation should be easy.”

The Cornell team won $1,000 in prize money in the competition. Joseph Regenstein, professor of food science, was the team’s faculty sponsor.

Food Science 101: Developing Award-Winning Ice Cream

Each year, students in Professor Joseph Hotchkiss’s course “Science and Technology of Foods” (Food Science 101) form teams, learn the science behind creating food products, and develop new ice cream flavors.

The class learns the technical aspects of commercial food processing, such as how much milk fat content would be acceptable to the discriminating palate, how much overrun (air content) to put in, and how much particulate (crunchy tidbits) to use. Each team also performs market research, and envisions and produces an ice cream flavor they believe would be popular.

Their final products are judged by a panel of seven, including Dean Daryl Lund. Eight students developed the fall 1998 winner, an ice cream flavor with the evocative name Sticky Bunz. Reminiscent of warm, gooey sticky buns fresh from the oven, this vanilla-based, cinnamon-flavored ice cream features butter crunchies, pecans, and a caramel swirl. Sticky Bunz was so popular it is now a permanent flavor at the Cornell Dairy Store.

1980s

1972 – The Integrated Pest Management Program is developed to help growers optimize expenditures by monitoring and forecasting the emergence of pests and using a combination of chemical, cultural, and biological controls.

1973 – Daniel G. Siskel Ph.D., ’62 receives the college’s first SUNY Chancellor’s Award for Excellence in Teaching.

Cornell plant pathologists Hans Van Etten and Olen Yoder identify and clone pathogenicity genes in pathogenic plant fungi. This breakthrough has important implications for the biological control of weeds (using fungi as biocontrol agents), studies on pathogenicity, and the construction of resistant plants.
INTERNATIONAL

Making Connections with China
Now and in the future China faces extraordinarily serious agricultural problems: limited per capita arable land; numerous farming areas with water shortages; frequent devastating natural events, such as floods and earthquakes, that reduce agricultural outputs; fragile ecosystems; lack of education; poor social services in rural areas; and low levels of adoption of new technologies.

In January 1998, Cornell President Hunter Rawlings, accompanied by Norman Scott, professor of agricultural and biological engineering, and Ray Wu, professor of biochemistry, traveled to China to meet with Chinese officials and formally sign several new memoranda of agreement (MOAs). These MOAs reflect both Cornell’s and the college’s long-standing relationships with Chinese institutions.

As an example, Ray Wu, who was born in Beijing, has a thriving collaborative research program in rice biotechnology that has led to scientific breakthroughs and to his induction as an honorary faculty member at fifteen different Chinese universities and institutes. Wu sees future collaborative research as offering benefits all around. “The Chinese are quite advanced in certain areas of biotechnology, in tra-
ditional plant breeding, in plant tissue culture, and in the regeneration of plants," says Wu, who, as a member of the first advisory board of the Chinese National Natural Science Foundation, was a key figure in encouraging the Chinese government to increase funding for scientific research during the last decade by more than sixfold.

In January 1997, Don Beermann, professor of animal science, was invited by Yuan Jingkui, director general of the Sichuan Provincial Commission of Science and Technology, to evaluate the technical feasibility of converting three meat-processing facilities near Chengdu to modified-atmosphere packaging of fresh pork. Beermann's next project, in collaboration with Dr. Guanghong Zhou of Nanjing Agricultural University, focuses on developing a grading system in China for beef. A coordinated nationwide grading system, as is common in Western countries, could boost profitability for Chinese producers while providing higher-quality products for consumers.

In the future, cooperative research between China and Cornell will focus on ten areas, ranging from plant breeding and plant protection to postharvest technologies and land and water management. For example, Tammo Steenhuis, professor of agricultural and biological engineering, coordinates an effort to increase Chinese crop produc-

tion in water-limited conditions by either increasing the water efficiency, finding alternative sources of water, or increasing the yield of existing water supplies. And Christopher Watkins, associate professor of fruit and vegetable science, heads an effort to adapt U.S. extension models for use in disseminating information to Chinese producers on maintaining fruit and vegetable quality after harvest.

**Improving Third World Nutrition**

Established in 1994 with support from the Cornell International Institute for Food, Agriculture, and Development (CIIFAD), the Food Systems for Improved Health (FSIH) program is developing ways to link food systems more closely to human needs for health and well-being.

In collaboration with CIIFAD's South Asia program, FSIH is introducing a food systems approach in that region. In October 1997, FSIH convened a workshop in Dhaka, Bangladesh, to address comprehensively what appears to be calcium-deficiency rickets. Workshop participants formed the Consortium for the Prevention of Rickets in Bangladesh, which is headed by FSIH, and planned an integrated program to clarify the origins of the disease, quantify its prevalence, and develop sustainable strategies for its prevention.

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1983 – Barbara McClintock B.S. ’23, M.A. ’25, Ph.D. ’27 is awarded the Nobel Prize in medicine and physiology for her work thirty years earlier in plant genetics. She had discovered that genes are not fixed but can jump from one spot to another on a chromosome of a plant, thus changing future generations of the plant.

1984 – Dale E. Bauman demonstrates that recombinant bovine somatotropin (BST) stimulates milk production in cows.
Recently, consortium members, led by Gerald Combs, professor of nutritional sciences, and John Duxbury, professor and chair of the Department of Soil, Crop, and Atmospheric Sciences, conducted preliminary analyses of food, water, and blood samples in the affected area; developed an action plan for clinical intervention; and collaborated with consortium partners to evaluate the prevalence of rickets in one district. FSIIH recently received a million-dollar grant from the USAID mission in Bangladesh to support the first two years of its action plan.

Reproductive Health Communication Workshop for Ethiopia
During the 1998 winter break, communication professors Royal Colle and Ronald Ostman conducted a two-week reproductive health communication workshop for Ethiopia's National Office of Population (NOP) in Addis Ababa. In addition to contraceptive use and family planning, reproductive health education in Ethiopia has many other aspects, including women's health, abortion issues, reducing maternal mortality rates, and increasing female participation in Ethiopian affairs.

The Ethiopian government asked Colle and Ostman to train people in IEC, Information Education and Communication. One type of extension/outreach of the Department of Communication, the workshop included discussions, a series of role-playing activities, field trips to both urban and rural areas in Ethiopia, and opportunities for workshop participants to conduct focus groups, one-on-one interviews, and panel forums at a television studio.

Colle and Ostman have conducted similar workshops for the World Health Organization in Bangladesh, India, Thailand, Zimbabwe, and China.

MPS in Agriculture with a Peace Corps Option
Cornell University and the U.S. Peace Corps signed a memorandum of cooperation in April 1998 to mark the establishment of a new educational option at Cornell—a three-year master of professional studies degree in agriculture with a Peace Corps service option. Coordinated by the college's International Agriculture Program, this educational program will emphasize the conservation of natural resources, sustainable farming systems, and international development.

Mark Gearan, director of the Peace Corps, was on campus to sign the agreement with Cornell President Hunter Rawlings, Provost Don Randel, Walter Cohen, dean of the Graduate School, and Daryl Lund, dean of the NYS College of Agriculture and Life Sciences.

Cornell's first student in the program, Christian Peters, gives it "two thumbs up." Since he was hoping to conduct his graduate research overseas, the master's international program sounded like the perfect option. He is currently a volunteer in Tanzania, a position that matches his interests in agriculture and sustainable development.

1985 - The Einset seedless grape is introduced after two decades of breeding.

1986 - Research support for the college reaches $54 million.

The gene gun and the biocides process are invented by plant scientist John Sanford, working with engineer Edward Wolf and mechanist Nelson Allen, to shoot DNA into plant and animal cells.

1990 - Thomas Eisner wins the Tyler Prize for his contributions to the understanding of the environment.

3,100 undergraduate students and 1,050 graduate students are enrolled in the college. Fifty-one percent of the students are women.
Global Seminar: Educating Students around the World about Environmental and Sustainable Food Systems

On October 7, 1997, the first Global Seminar was held in not one but three far-flung locations—the United States, the Netherlands, and Costa Rica. Course participants were joined by satellite, interactive videoconferencing, computer networking, and other channels of communication. An international collaborative effort, the Global Seminar is a fully interactive distance education course on environment and sustainable food systems involving undergraduate and graduate students around the world. Associate Dean for Academic Programs H. Dean Sutphin and graduate students Fernando Neri and Kathleen Kelsey organize and run the college’s program.

In 1997–98 five seminars were produced by partnering institutions in the Netherlands, Costa Rica, Honduras, Sweden, Australia, and the United States. The seminars covered a range of topics, including human sustainability, environmental conflict resolution through sustainable development, and community development. By using case studies such as the New York City watershed and the Zamorano, Honduras, community fire prevention and control initiative, participating students learned to apply environmental theory to real-world problems. The technology afforded them a rare opportunity for in-depth discussions of environmental issues with each other and with international experts.

International Agriculture 602: Students Study in Honduras

Each January the course “Agriculture in Developing Nations” (International Agriculture 602) takes students and faculty to a developing nation in Central or South America for two weeks. From 1991 to 1997 the class visited Honduras. It’s an ideal location according to Robert Blake, professor of international animal science and course coordinator since 1995, because of the variety of ecosystems and social systems located within a very small area.

Student groups, each with a faculty adviser, study topics that range from plant genetic diversity in tropical agroecosystems to chronic malnutrition to the impact of government intervention on local agriculture.

A recent class participant summed up his experiences by saying, “The class opened up new opportunities for my future work and, more than any other course I’ve taken, it changed the way I will look at the world in the future. Isn’t that what a class should do?”

1990 – The Cornell International Institute for Food, Agriculture, and Development (CIIFAD) is established, enabling faculty and students to pursue advancements in knowledge and practice for sustainable agricultural and rural development.

1990 – The Community and Rural Development Institute (CaRDI) is established. The institute seeks to improve the quality of life in rural and urban communities.

1991 – The Cornell Center for the Environment (CfE) is established. CfE focuses on environmental issues, with the goals of enhancing the quality of life, encouraging economic vitality, and promoting the conservation of natural resources for a sustainable future.
LIFE SCIENCES

"Matrix Mill" Technology Improves Food Varieties
In the past, plant breeders used lengthy analyses to identify variants with desirable traits. With the "matrix mill"—an emerging technology created by horticulture science professor Norm Weeden—what once took months can now be accomplished in a matter of days. This new device grinds plant or animal tissue and extracts the DNA, making it available for such genetic studies as marker-assisted selection.

Weeden developed the technology for the matrix mill in 1995. The prototype was built and tested the following winter with co-inventors Joe Celeste, a former machinist at Rumsey Loomis, of Freeville, N.Y., and Dale Loomis, a designer and owner of Rumsey Loomis.

About ten matrix mills currently exist. One is in Weeden’s lab. The others are being used at sites around the world such as the New Zealand horticultural apple-gene mapping program.

The matrix mill technology is in the process of being transferred to the private sector for commercial development. With help from the Cornell Research Foundation, Weeden and his co-inventors applied for a patent and are looking for a partner to help produce the device commercially.

CALS Leads Major Areas of Cornell Genomics Initiative
The Cornell Genomics Initiative is a broad interdisciplinary effort directed at understanding the function of genes in many different organisms. The initiative involves the Colleges of Agriculture and Life Sciences, Arts and Sciences, Veterinary Medicine, Engineering, and Human Ecology; the Boyce Thompson Institute; the USDA/ARS Plant, Soil, and Nutrition Laboratory; and the Cornell Medical College in New York City. As a strong force behind the Genomics Initiative, this college and its faculty are paving the way for the future of biology.

Steven Tanksley, the Liberty Hyde Bailey Professor of Plant Breeding and chair of the Genomics Task Force, and Susan McCouch, assistant professor of plant breeding, use modern molecular techniques to systematically map the genes of rice and tomatoes and to identify chromosome regions critical to crop improvement. In rice they identified genetic regions from a wild ancestor for such production-enhanc-
ing traits as grains per plant, disease resistance and earliness, and are in the process of transferring them into domestic rice varieties. Their latest work demonstrates enhanced production using these genes in a variety of upland rice grown primarily by poor farmers under adverse conditions. This follows earlier successes with domesticated varieties commonly grown under more favorable, “bread-basket” conditions.

Ray Wu, professor of biochemistry and a pioneer in the field of molecular genetics, uses multiple molecular approaches to introduce agronomically useful genes into rice and other monocots. Recent successes include the production of insect-resistant rice plants and drought- and salt-tolerant transgenic rice plants.

Mark Sorrells, professor of plant breeding, works with wheat and other small grains. His research involves comparative analysis of genome structure and function for grain groups, including wheat, barley, oat, rice, and maize with the long-term goal of identifying superior alleles for genes of economic importance so that they can be assembled into superior crop cultivars.

Plant breeding colleagues Steven Tanksley, Susan McCouch, and Mark Sorrells, with support from the U.S. Department of Agriculture, have developed and maintain three critically important databases: SolGenes (solana-

ceous crops, including tomato, potato, and pepper); RiceGenes (rice); and GrainGenes (wheat). Internationally accessible, these electronic databases provide scientists worldwide with such useful information as genome sequences; molecular, morphological, and comparative maps; location of known genes; and germplasm records.

Plant pathologist Dennis Gonsalves, who collaborated on the release of the world’s first genetically engineered fruit crop—papaya—in September 1996, helps train scientists from other countries in “useful technology transfer” and develops common approaches to specific problems.

Tony Shelton, professor of entomology, and Elizabeth Earle, professor of plant breeding, are collaborating on a project to develop safe strategies for deploying plants that have been engineered to express toxins, specifically those from the naturally occurring bacterium Bacillus thuringiensis. Although these toxins have been used for more than forty years as foliar-applied insecticides, potential deleterious impacts of the widespread distribution of Bt transgenic plants (e.g., insect resistance or toxicity to nonpests) are of concern.

**CU Scientists Isolate Unusual Bacterium with Appetite for Pollutants**

Stephen Zinder, professor and chair of the Department of Microbiology, graduate student Xavier Maymo-Gatell, and others isolated an antibiotic-resistant bacterium from sewer sludge that might point the way to better water pollution cleanup strategies. The bacterium reduces the toxic pollutants tetrachlorethene and trichloroethene to nontoxic ethene gas.

Although Strain 195 is not effective against all pollutants, the tiny pollution eater may be a match for some of the most irreducible compounds that modern chemistry has devised.

“It’s as if this bug was born to dechlorinate,” Zinder says.

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1995 – The Cornell Program on Breast Cancer and Environmental Risk Factors (BCERF), directed by June Fessenden Macdonald, professor of biochemistry, is created to supply information about the links between environmental risk factors and breast cancer.

1996 – Papaya is the first genetically engineered fruit crop to be released. Plant pathologist Dennis Gonsalves collaborated on this project.

1998 – Carl Batt, professor of food science, collaborates with Harold Craighead, professor of applied and engineering physics, to create biosensors that can detect microorganisms, such as E. coli, in food and the environment.
A Living Laboratory in the Amazon Rainforest of Venezuela

Will a cup of lichen tea four times a day cure a urinary tract infection? Can a bird’s choice of nest-building materials boost its immune system? Why do some Indians prefer the honey of stingless bees over killer bee honey?

Students of chemical ecology spent last summer in the Amazon rainforest of Venezuela answering these questions. They applied modern analytical techniques to learn the chemistry behind the nature-based medicinals used by native peoples—and that someday may find a place on our druggists’ shelves. Eloy Rodriguez, the James Perkins Professor of Environmental Studies and a biologist who has discovered ten plants from the Amazon with antimalarial properties, led the trip.

Students collected and studied the medical applications of insects, algae, and plants for such ailments as skin fungi, diarrhea, snake bites, muscle injuries, and asthma. With the encouragement of Rodriguez, a pioneer in the field of zoopharmacognosy (the study of natural medicines used by animals), the students took ethnobotany (the study of plants used by people) one step further. They discovered how animals’ use of medicinal plants is incorporated into human medical tradition. One example is the citrus rinds that both capuchin monkeys and humans rub on themselves to control mite and flea infestations.

“The indigenous people have known about most of these plants all along. Our job as scientists is to validate their knowledge by doing the bioassays that prove the plants’ effectiveness against disease,” says Rodriguez.

When the students returned, they published their research findings in Emanations from the Rainforest, the first, and so far only, scientific journal about ethnobotany and chemical ecology written and edited by Cornell college students.

1998 – The Cornell Genomics Task Force, chaired by professor of plant breeding Steven Tanley, issues a planning document that spells out the five major areas for the Cornell Genomics Initiative: computational genomics and bioinformatics, nanobiotechnology, mammalian genomics, microbial genomics, and plant genomics.

1998 – The most popular undergraduate majors in the college are applied economics and business management, biological science, animal science, communication, and natural resources.
Entomology 215: Arachnophiles in Training

Given their propensity for horror movie behavior, it's little wonder that spiders provoke an immediate reaction of fear and disgust from students. That's why entomology instructor Linda Rayor does several unusual things: she shows students in her course on spiders a comedy-horror film called Arachnophobia; she talks about spiders with enthusiasm, curiosity, and excitement; and she constantly exposes her students to all manner of spiders.

Eventually this psychology pays off, as Rayor watches a class full of arachnophobes turn into freshly minted arachnophiles. Jennifer Chow, a junior from Voorhees, N.J., began the course in August 1998 with the usual fear and loathing of spiders. By the end of the semester she owned a Zebra tarantula (Aphonopelma seemanni) with venomous fangs and irritating hair. In addition to understanding spider behavior and how they adjust to their environment, Rayor's students learn the relative risks of poisonous spiders and how silk works.

Rayor has been teaching "Spider Biology: Life on a Silken Thread" (Entomology 215) since 1994. The course has become such a success that Rayor receives requests from universities across the United States for her syllabus.

Entomology/Neurobiology and Behavior

Tom Eisner, the J. G. Schurman Professor of Entomology, leads a field trip on chemical prospecting for science journalists and educators. The field excursion was part of a Cornell workshop featuring some of the university's best communicators about science.

1999 – The Division of Biological Sciences is reorganized. The division's eight sections become five departments: Ecology and Evolutionary Biology, Microbiology, Molecular Biology and Genetics, Neurobiology and Development, and Plant Biology, that are associated with either the College of Agriculture and Life Sciences or the College of Arts and Sciences.
Knowing how Strain 195 works in the laboratory, the Cornell team led by Zinder and professor of civil and environmental engineering James M. Gossett is better prepared to develop bioremediation protocols. One project, funded by the U.S. Air Force, will take them to military bases that have subterranean pollution problems.

**Biologist Closes In on Midshipman Fish Mate Selection**

How does a female midshipman cut through the humming racket of competing males and find Mr. Right? Professor of neurobiology and behavior Andrew Bass and his colleagues have unlocked the mystery of mate selection for what might be the ugliest fish in the sea.

Using computer synthesizers, they reproduced the male midshipman's hum and then studied the female's response. What they found could apply to humans as well as the midshipman fish. The neurons of the female midshipman's midbrain (humans have midbrains and hindbrains, too) form codes of all the noises that then help them isolate one interesting signal. "Neuroscientists call this auditory scene analysis," says Bass, who published the findings in the *Journal of Neuroscience* with Deana Bodnar, senior research associate in neurobiology and behavior.

**Biochemistry Professor Elected to the National Academy of Sciences**

Biochemistry professor Jeffrey W. Roberts was recently elected as one of sixty new members of the National Academy of Sciences (NAS), an organization dedicated to the furtherance of science and its contributions to general welfare. Election to this prestigious group is considered one of the highest honors given to a researcher.

Roberts joined the faculty in 1974 and is now the Robert J. Appel Professor of Molecular and Cell Biology in the Department of Molecular Biology and Genetics. A co-author of *Molecular Biology of the Gene*, fourth edition, his current research centers on transcription antiterminators, regulatory proteins that control a key step in the synthesis of messenger RNA by the enzyme RNA polymerase. His previous honors include election to the American Academy of Arts and Sciences and the Society of Fellows of Harvard University (1970–73) and receipt of a Career Development Award from the National Institutes of Health.
NEW YORK STATE COLLEGE OF AGRICULTURE AND LIFE SCIENCES
Statement of Current Fund Revenues, Expenditures, and Other Changes for the Year Ended June 30, 1998

Revenues

- Tuition and Fees 25.9%
- State Appropriations 26.6%
- Federal Appropriations 6.2%
- Grants and Contracts 23.8%
- Private Support 9.0%
- Investment Income 2.2%
- Other Sources 6.3%

Expenditures

- Research 34.5%
- Extension/Outreach 15.3%
- Academic Support 5.9%
- Student Services 4.6%
- Institutional Support and Plant 11.6%
- Teaching 23.1%
- Financial Aid 5.0%