

New York State Agricultural Experiment Station



A S U N Y C A M P U S I N G E N E V A , N Y

# THE YEAR IN REVIEW

1998

*From Molecules  
to Markets . . .*

ENEVA  
*Means Business  
for New York*

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CORNELL  
UNIVERSITY

COLLEGE OF AGRICULTURE AND LIFE SCIENCES

## FROM THE DIRECTOR . . .



**M**aintaining and strengthening the food and agricultural industries in New York is GENEVA's mission. Critical challenges include helping growers and food processors to manage new or genetically altered pests, minimize the impact of agriculture on the environment, respond to global markets, and deal with major government regulations like the Food Quality Protection Act. This year we reallocated funds and filled three academic level positions to help meet some of the challenges facing the agricultural and food industries of New York.

In 1997, GENEVA received a special allocation of \$600,000 from the legislature—the result of a joint effort by Governor Pataki and key legislators, with encouragement from the New York Farm Bureau and many others. We were honored that the Governor came to GENEVA in September, 1997, to announce the award and to learn more about our programs. The money was used to purchase laboratory equipment needed by the three recently hired scientists, processing equipment to help modernize the fruit and vegetable processing pilot plant that is used to help companies meet their research and development needs, and farm equipment for field research.

This special allocation was a critical step in funding the GENEVA Plan—a plan that strengthens the capacity of the New York State Agricultural Experiment Station at Geneva to improve the state's economy by meeting the needs of New York's agricultural and food businesses as we move into the 21st century. The theme of the GENEVA Plan, "From Molecules to Markets, GENEVA Means Business for New York," underscores the crucial role of research in maintaining New York's economic competitiveness in domestic and world markets.

On a related front, GENEVA began working with the city, the county, and others to determine the potential for developing an Agricultural Technology and Business Park on Station land for companies with activities related to traditional and emerging technologies at GENEVA, including biotechnology.

To meet the challenges facing agricultural and food businesses in New York, and encourage retention and expansion of new agricultural, food, and biotechnology companies, we continue to seek full funding for the GENEVA Plan.

We have already received \$1.2 million of the \$2.8 million requested for one-time purchase of equipment.

We have not received any of the \$2.6 million increase in the annual state budget for GENEVA that is needed to hire key research and extension leaders and support staff, and to help fund program

costs.\*

Full funding of the GENEVA Plan is essential for the Station to accomplish the specific goals of the Plan: To improve the competitiveness and profitability of growers and processors of fruit and vegetable crops; increase market share for New York producers; ensure consumers access to wholesome, high quality, reasonably priced foods produced in New York; and safeguard the environment.

In 1999, our goals are to achieve:

- \$600,000 to continue upgrading equipment and facilities;
- \$900,000 of the \$2.6 million increase in GENEVA's annual base budget.

James Hunter, Director  
New York State  
Agricultural Experiment Station

\* The Station's annual base budget is a percentage of what Cornell University receives from the State University of New York (SUNY).

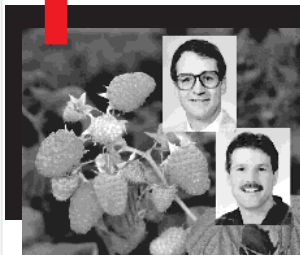


# Accomplishments WITH Impact:

## DEVELOPING & SELECTING NEW CROP VARIETIES

### • Extending the Season

Released 'Prelude' and 'Encore', two raspberry varieties that extend the harvest season earlier and later, and should expand growers' share of the raspberry market on the East Coast and in the Great Lakes Region.



John Sanford (top) and Kevin Maloney (bottom) bred two new raspberries that extend the berry season for growers and consumers.

### • Breeding Disease-Resistant

#### Vegetables

Released 'Whitaker', a summer squash variety that is resistant to three viruses and one fungal disease, using two wild species from Central America as parents. Also released 'Onondaga', a head lettuce bred for conditions in New York—the only lettuce resistant to cucumber mosaic virus and corky root rot.

Joe Shail (left) and Dick Robinson (right) bred squash and lettuce varieties that are resistant to crop-damaging diseases in New York.



### • Improving Apple

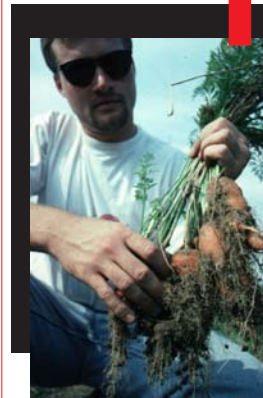
**Rootstocks** Released Geneva 16, a dwarfing rootstock that is resistant to fire blight and crown rot, produces no suckers, has few burrknots, and has good anchoring ability. Growers will use the rootstock in new orchard plantings in New York to help increase competitiveness in world markets.

### Growing Crops Competitively

#### • Controlling Root Pests

Determined that planting sudangrass in commercial fields of onions, carrots, and lettuce dramatically reduces the damage caused by the northern root-knot nematode in the following year. The nematode can reduce onion bulb weight by as much as 70 percent and marketable carrot yield by as much as 45 percent. Traditionally, this and other plant-parasitic nematodes are controlled by pre-plant soil fumigation with chemicals at a cost of more than \$500/acre, or by in-furrow or broadcast applications of the chemical Vydate to carrots at a cost of \$100-\$200/acre. While the major limitation of

sudangrass treatment is the need to keep fields out of production for one year, planting sudangrass is an effective control alternative that also improves soil structure and fertility, and reduces soil compaction.



Joshua Bossard was a member of the team of plant pathologists that proved that sudangrass can reduce nematode damage to root crops. In carrots (shown above), nematodes cause excessive forking, root hairiness, and galling.

#### • Improving Root Health

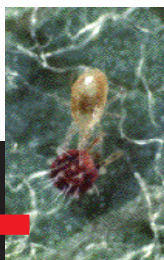
Found a single strain of the biocontrol fungus *Trichoderma harzianum* that can colonize roots for the life of an annual crop, thereby improving root health and function, and increasing crop yield. The technology was developed at GENEVA and is now licensed for commercial development in the private sector.

### Growing Healthy Crops & Sustaining the Environment

#### • Saving Genes of Wild Apples

Collected endangered apple germplasm from China in partnership with the USDA-ARS to expand GENEVA's 'living library' of genetic material. Apple breeders use the material to develop new rootstocks and apple varieties that are naturally resistant to insects and diseases, thereby requiring less quantities of pesticides.

• **Mite Eating Mites** Improved biological control of European red mite (ERM) in Northeast apple orchards by releasing the mite predator *Typhlodromus pyri*. Releases were made in 44 orchards in six states and four vineyards on Long Island. Biological control of ERM was realized in approximately 50 percent of the sites in both orchards and vineyards where predators were released in 1996, and in nearly all sites in 1997. Establishment of this predator in the Northeast would result in one to two fewer pesticide applications in most orchards each year and nearly eliminate damage to leaves from ERM that can lead to decreased yield and fruit quality.



Entomologists led by Jan Nyrop (inset) released the predator mite *Typhlodromus pyri* in orchards throughout the Northeast to provide biological control of the European red mite.

• **Reducing Pesticides** Improved strategies for controlling fungal diseases of apples that affect yield and fruit quality. A decade of research at GENEVA and the Hudson Valley Lab resulted in the elimination of at least two fungicide sprays previously needed by growers to control apple scab, flyspeck, and black rot fruit decay. The reduction of a single application of fungicide results in \$270,000 in savings for the eastern New York apple industry. Reducing the number of fungicide applications also reduces rural/suburban conflicts associated with pesticide application issues.



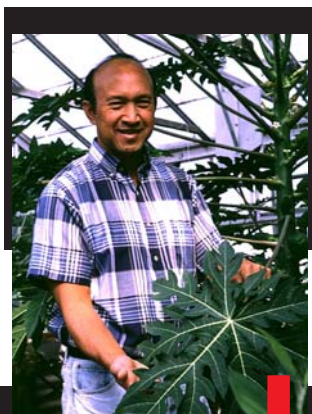
Wild apple germplasm from China was brought back to breeders at GENEVA by Herb Aldwinckle and Phil Forsline of the Experiment Station and the USDA, respectively. Wild genes from centers of species origin like China are used to develop new apples.

### Applying Biotechnology in Agriculture

• **Developing Insect-Resistant Plants** Found several chitinolytic enzymes in soil-dwelling bacteria that survive in the alkaline guts of herbivorous insects and inhibit their growth and/or development. Genes of these enzymes were cloned and then used to make transgenic tomato, tobacco, apple, and

coffee plants. Ongoing studies show that these transformed plants have enhanced resistance against their major insect pest species.

• **Developing Virus-Resistant Plants** Developed the technology to genetically engineer plants to be resistant to viruses and obtained the first government approval to release a genetically engineered perennial fruit crop to commercial growers. The techniques developed are now being applied to improve important New York fruit crops like apple and grape.



Plant pathologist Dennis Gonsalves engineered the first virus-resistant perennial fruit crop to be released to growers. It is a model system for apples and grapes.

### Ensuring a Safer Food Supply

• **Treat with Ultraviolet, Then Pass the Cider** Tested an inexpensive ultraviolet (UV) light irradiation unit capable of eliminating contamination by *E. coli* 0157:H7 and other pathogens in commercial apple cider. The unit is small, inexpensive, and does not alter the taste of cider. The work was accomplished by microbiologists at GENEVA in cooperation with the private sector.



At the Food Venture Center, senior extension associate Olga Padilla-Zakour (right) and Judy Anderson (left) helped entrepreneurs bring new and/or improved food products to markets.

### ASSURING HIGH QUALITY FOODS

• **The 'Brett' Pack Uncorks a Mystery** Isolated and characterized brettanomyces yeast from wine and completed a physiological and genetic characterization of the 'brett' genes and species, until now an unidentified source of off-flavors in wine. Understanding the complex aroma chemistry of wine and the microbiology that creates it enables winemakers to control wine flavor and make a better product.



Food scientists (left to right) Thomas Henick-Kling, Terry Acree, Chris Egli, and Jonathan Licker characterized naturally-occurring yeast that can cause off-flavors in wine.

### Developing Value-Added Products & Processes

• **Apples by the Slice** Developed a "minimal process" technology whereby apple slices are dipped into ascorbic acid (Vitamin C) to prevent contamination and browning, then blow dried and packed into modified atmosphere containers. In 1998, Nature's Pleasures, in Wolcott, NY, built a 7,000 sq. ft. processing plant to utilize the technology to market apples by the slice in brightly-designed 'fresh fruit packs' to schoolchildren, airline passengers, and consumers.

Process chemist C.Y. Lee helped Nature's Pleasures utilize the 'minimal process' technology he developed to produce fresh apple packs for schoolchildren.



### Fostering Economic Development

#### • Bringing Products to Market

Helped 84 entrepreneurs who contacted the New York State Food Venture Center at GENEVA receive approval for the establishment of 319 new/improved food products. Of 380 general inquiries made, 252 were specific to new products or scheduled process services.

#### • New Wine & Brew Lab

Initiated development of a 2,000 sq. ft. Cornell Vinification & Brewing Technology Laboratory to stimulate development of brewing, wine, and equipment supply industries through innovative science and technology. Local wine trails, area manufacturers, entrepreneurs, and friends committed over \$50,000 in fiscal support to the project.

## Reaching Out To Educate

### • Educating Schoolchildren

Conducted hands-on outreach programs in entomology and plant science for local elementary students. Demonstrated diversity in fruit varieties, chemical communication between insects, and how insects make choices about their mates and food.

### • Extending Knowledge to Industry

Held a number of fruit and vegetable schools for growers and processors, including: a New York Stone Fruit School, Processing Sweet Corn and Snap Bean Field Day, the Third Annual Northeast Buckwheat Field Day, Better Process Control School, Apple Cider Processing and Safety Workshop, Western New York IFT Food Industry Expo, 26th Annual New York Wine Industry Workshop, and numerous others. New York's food and agriculture industries benefit from the transfer of research results from GENEVA and the opportunity to network in a research setting.

### • Informing Entrepreneurs

Initiated the "Food Venture Center" newsletter to inform small processors, entrepreneurs, cooperative extension, and interested parties about current activities, regulations, processing, and food safety guidelines.

### • Learning Via the Web

Established a web site that provides readily accessible information about the use of natural enemies to control pests in commercial agriculture and home gardens. "Biological Control: A Guide to Natural Enemies in North America," at [www.nysaes.cornell.edu/ent/biocontrol](http://www.nysaes.cornell.edu/ent/biocontrol) describes life stages, how natural enemies can be used

for control, and includes full-color photographs for identification purposes. The site functions as a tutorial on biological control and integrated pest management, and receives more than 6,000 visits per week.

• **Educating the Best and the Brightest** Each year, 75 to 90 Cornell graduate students from all over the world work closely with faculty at GENEVA to complete research for master or doctoral degrees. This next generation of scientists brings insights into emerging technologies and critical ideas that help keep research at GENEVA on the cutting edge.



*Horticulturist Alan Lakso explained the remarkable diversity of apples in skin color, size, and taste to students on field tours from the Head Start program at North Street School.*

## Key Financial Facts

July 1, 1997-June 30, 1998

## OUR MISSION

GENEVA supports New York's fruit and vegetable industries with research and extension programs that help:

- improve the competitiveness and profitability of growers and processors of fruit and vegetable crops while safeguarding the environment;
- increase market share for New York producers;
- ensure consumers access to wholesome, high quality, and reasonably priced foods produced in New York;
- attract and retain agricultural, food, and biotechnology companies to New York and promote the establishment of start-up companies based on knowledge developed at GENEVA.

## VITAL STATISTICS

- Established in 1880
- Four academic units; five support units
- Outlying labs in Fredonia and Highland
- 300 employees (200 on state funds):
  - 52 professors and program leaders
  - 28 other Ph.D.-level scientists
- 75 graduate students
- 16 visiting scientists in residence
- 900-acre campus, including:
  - 850 acres of farm land for research
  - 1 acre of greenhouse space
- 623,000 square feet of buildings
- Annual budget of approximately \$20M (\$10.8M funded through SUNY)



*GENEVA is recognized as a national leader in grape and wine research and extension.*

## NEW PROGRAM LEADERS

**Dr. Olga Padilla-Zakour** was hired as a Senior Extension Associate to provide leadership for the Food Venture Center. She has helped many entrepreneurs take the necessary steps to obtain government approval to make new processed food products.

**Dr. Randy Worobo** was hired as Assistant Professor of Food Microbiology, and immediately began research and extension activities to help New York apple cider producers deal with the threat of *E. coli* contamination.

**Dr. Terry Bates** was hired to work with the Lake Erie Regional Grape Program in Fredonia to improve production technology for native American grapes in western New York (19,000 acres).

Plant geneticist **Dr. William Johnson** was hired by the USDA and located at GENEVA to direct an ongoing program in collaboration with Experiment Station scientists to develop disease-resistant apple rootstocks.

## SELECT FACULTY AWARDS

**Thomas Burr**, Plant Pathology, Fellow in the American Phytopathological Society.

**Wayne Wilcox**, Plant Pathology, Lee M. Hutchins Award from the American Phytopathological Society.

**Michael G. Villani**, Entomology, Recognition Award in Urban Entomology from the Entomological Society of America.

**Malcolm C. Bourne**, Food Science & Technology, Inaugural Fellow, by the International Union of Food Science and Technology.

**Susan Brown**, Horticultural Sciences, Outstanding Research Award from the New York Farmers Club for her contributions in breeding apples.

## FOR MORE INFORMATION

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**Agricultural progress through research.**

**<http://www.nysaes.cornell.edu>**

## Expanding Programs Through Partnerships

### Support from Key Legislators

"The New York State Agricultural Experiment Station at Geneva...is a world-recognized leader in horticultural and food science research and offers tremendous business opportunities in this field," wrote Governor George Pataki in an editorial entitled "New York Sees a Biotech Future," in the June 1998 issue of *Genetic Engineering News*.

When the Governor came to GENEVA to deliver the first \$600,000 appropriation from the New York State Legislature on Sept. 4, 1997, he said, "...we are going to make sure the GENEVA Plan is the GENEVA reality so you have the resources to take the research into the 21st century."



When Governor George Pataki visited GENEVA in September, Helene Dillard, chair woman of the Plant Pathology Department, demonstrated the positive long-term impacts of research on commercial agriculture.

**PARTNERSHIP ■ CITY—STATION—STATE:** The City of Geneva, the Experiment Station, and the State University of New York (SUNY) are developing plans to build a research park on land adjacent to the main campus. The City, County, Geneva Growth, Inc., and Station funded an \$18,000 market feasibility study and the SUNY Construction Fund paid for an environmental impact assessment—two important first steps in attracting start-up and established agribusinesses and biotech companies to GENEVA for collaborative research.

**PARTNERSHIP ■ USDA:** Permission was granted in 1995 by the USDA's Animal and Plant Health Inspection Service (APHIS) to establish a Research and Evaluation Quarantine (REQ) Block for grapes at GENEVA. The REQ allows scientists at Cornell and the USDA unit located at GENEVA to greatly reduce the cost and time to evaluate the potential of foreign varieties and clones under New York conditions. The first cuttings were planted in 1998.

**PARTNERSHIP ■ UNIVERSITY of CALIFORNIA at DAVIS:** In each of the last two years, Congress has funded a \$500,000 Federal Viticulture Consortium Grant, administered by UC-Davis and Cornell-Geneva, to support research to strengthen the grape industry in the face of global competition. New York and California lead the nation in total grape acreage, and the production of grape juice and wine.

**PARTNERSHIP ■ PENN STATE:** The Lake Erie Regional Grape Program is a collaborative effort between Cornell University and Penn State University. The processing industry contributes \$.75/ton of grapes per year to support research and extension programs in the Lake Erie grape belt.

**PARTNERSHIP ■ The USDA-AGRICULTURAL RESEARCH SERVICE PLANT GENETICS RESEARCH UNIT (USDA-ARS PGRU):** A component of the National Plant Germplasm System, the USDA-ARS PGRU is located at GENEVA. Researchers acquire, maintain, characterize, document, and distribute genetic resources from certain seed-propagated crops, apple, cherry and cold-hardy grapes. Cooperation and joint efforts with GENEVA scientists is common.

**PARTNERSHIP ■ INDUSTRY:** GENEVA technology can be licensed from the Cornell Research Foundation for commercial development.

**Patent Activity:** July '97-June '98  
31 U.S. patents pending  
7 U.S. patents issued  
16 Foreign patents pending  
2 Foreign patents issued



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