



## ***The Louis W. Schatz Center for Tree Molecular Genetics***

### **Progress Report**

July 1, 2003

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This report summarizes activities in *The Louis W. Schatz Center for Tree Molecular Genetics at Pennsylvania State University* for the period of January 1 to June 30, 2003. This exciting period in the life of *The Schatz Center* has seen the establishment of the major endowments that will support the center, and the initiation of the permanent positions and awards that form the heart of *The Schatz Center*.

The complete disbursements from The Louis W. Schatz estate were received and invested by Penn State University in March of 2003. As instructed by *The Schatz Center* contract, several endowments were immediately established with the estate gift. These endowments provide support for the features of *The Schatz Center* at Penn State that make the center unique among tree molecular genetics & biotechnology centers. The endowments now support 1) a *Schatz Post-Doctoral Fellowship* for young Ph.D.-level scientists to join *The Schatz Center* for two to three year apprenticeships, 2) a *Schatz Visiting Scholars* fund for scientists and students from university, industry and government labs to work with *Schatz Center* faculty for up to one year, 3) the *Schatz Awards for Undergraduate Research* for students to conduct research projects with center faculty members, 4) a biannual colloquium where scientists from around the world can present their latest research findings, 5) new library collections relevant to forestry and tree genetics, and 6) partial support for a new faculty position in forest genetics at the Mont Alto technical forestry school campus.

The Louis W. Schatz estate gift is also supporting construction of a new building for the School of Forest Resources on the University Park campus. Detailed plans for the new building, which includes research lab and office space for *The Schatz Center*, were included in the previous report. Although the official start of construction of the new building is September, 2003, earth-moving equipment are already busy at the building site. We eagerly anticipate having as many Schatz family members as possible attend the opening ceremonies for the new School of Forest Resources building in mid-2005. Until then, *The Schatz Center* continues to enjoy high quality research space within the Biotechnology Institute building (the "Wartik Lab") in the center of the University Park campus.

Dr. Schatz's vision of a major research center to address issues in forest health and productivity through forward-looking, cutting-edge research is now well on its way with establishment of the several endowments described above. The new endowments will help us to pursue the ambitious research agenda required to ensure the global preeminence of *The Schatz Center*. The Director of *The Schatz Center*, Dr. John Carlson, initiated searches in April for the Schatz Post-doctoral Fellow and Visiting Scientist positions through wide distribution of announcements to individuals, organizations, and postings at relevant job web sites. It is expected that the positions will be filled by the Fall of 2003. As the Visiting Scientist position is to be offered annually and up to a year's notice is

often required for scientists to arrange such sabbatical leaves, announcements for that position will be posted continuously.

Announcements of the Schatz Undergraduate Research Awards have been distributed to all life sciences departments and the Schreyer Honors College at the University Park campus at least twice per year since the initial, partial gift for the awards was received three years ago. With the full endowments for the student awards now in place, even more extensive contacts with promising undergraduate students will be pursued, at both campuses. The Schatz Undergraduate Research Awards program is already a success. We have attracted numerous gifted undergraduate students from several majors to obtain their first research experiences in forest-related genetics projects in *The Schatz Center*. The awards have supported several honors theses and most of the Schatz Undergraduate Scholars have gone on to attend graduate or professional school in a related area of science. The three undergraduate students featured in the photo on the first page (Maureen Canavan, Annie Gillis, and Holly Marking) are shown with the Christmas tree tissue culture lines that they have helped to establish in a research project in *The Schatz Center*. These 3 students graduated this Spring and are all starting graduate school in August, 2003, in well respected molecular genetics programs. The recent expansion of the undergraduate research awards program will further promote the visibility and impact of *The Schatz Center* across the university.

The Director will be assisted in recruiting excellent students and scholars to the Center by the Schatz Professor of Tree Genetics at the Mont Alto campus, and other faculty members associated with the center. One step recently pursued by the Director to formalize *The Schatz Center*, now that funding from the Schatz estate is in place, has been to offer memberships in the center to additional faculty at Penn State who have similar interests in forest genetics, and / or with whom the Director is already collaborating in relevant research projects. Full memberships in *The Schatz Center* are being provided to faculty in the School of Forest Resources, and associate memberships to faculty in other departments across the university who are conducting research relevantly to the mission of the Center. New, full members of *The Schatz Center* include Dr. Carlson's two tree genetics colleagues in the School of Forest Resources – Dr. Henry Gerhold and Dr. Kim Steiner, who together have contributed over 60 years to Penn State in such tree genetics research and training topics as Christmas tree breeding, forest population genetics, urban forestry, and forest regeneration. Associate members include faculty at PSU with expertise in forest entomology, forest pathology, tree physiology, plant evolution, chemical ecology, forest ecology, and conservation biology. This breadth of research interests among members of the center provides many opportunities for multi-disciplinary collaborations that will greatly improve upon the center's ability to reach our research and training mandates, and Dr. Schatz's vision.

The externally, competitively funded research projects in *The Schatz Center* have been described in previous reports. Dr. Carlson would be pleased to discuss any of the ongoing or planned projects in more detail. Research in *The Schatz Center* covers a variety of biotechnology and genetics activities including tissue culture, conservation genetics, and tree genomics. In one of our projects, students are using DNA fingerprinting to match seedlings with parent trees to detect patterns of oak regeneration in old growth forests. In another project students are cloning and characterizing genes for wood production in trees. A tissue culture project is underway to develop micropropagation protocols for Christmas tree seedlings. A graduate student in *The Schatz Center* is studying the role that anti-oxidant enzymes in maple trees may have in protecting certain species from toxic levels of Manganese in the soil, that results from acid rain. We are developing a molecular technique to help accelerate the American Chestnut Foundation's efforts to restore American chestnut to eastern forests. Also, *The Schatz Center* is involved in two large national research programs – one to create and distribute new DNA libraries to facilitate research on important plant species, and the other to discover the genes responsible for the development of flowers in plants, including forest trees. Students in the Xi Sigma Pi forestry honor society prepared a planting site in the university's research forest for new populations of chestnut seedlings, and helped to plant offspring from new crosses that Dr. Carlson is conducting between blight sensitive American Chestnut trees and blight resistant Chinese chestnut trees, this Spring. The planting site in the university's research forest will also serve as a demonstration plot for visitors to the forest. Students participating in the chestnut seedling project have again expressed interest in traveling to California to meet forestry students and staff at Humboldt State University and tour the Humboldt research forest with Mr. Gordon Schatz, as soon as it can be arranged.

A new internet web site is being prepared by Dr. Carlson and College of Agricultural Sciences IT staff specifically to host information about *The Schatz Center*. The *Schatz Center* web site will be finished shortly and will be accessible at the address <http://www.schatz.cas.psu.edu>. Please visit the site at your convenience and let us know what you think. Updates, such as new projects and students, will be added on a regular basis.



## ***The Louis W. Schatz Center for Tree Molecular Genetics***

### **Research Update**

January 6, 2003

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This report summarizes the activities of *The Louis W. Schatz Center for Tree Molecular Genetics* for the period of July 1 to December 31, 2002.

Our goal for the Center is to fulfill Dr. Schatz's vision of healthy and productive forests in the future through forward-looking, cutting-edge research. We have developed a diverse research portfolio that will help to ensure the success and preeminence of *The Schatz Center* when it becomes fully implemented through Dr. Schatz's generous estate gifts.

At the end of 2002, the Trustee for the Schatz estate informed us that complete disbursements will be conducted to the university by the end of January, 2003. Thus, by the beginning of the university's next fiscal year, July 1, 2001, earnings on the endowments established with the estate gift should have accrued to a sufficient level to provide support to implement all of the unique features of *The Schatz Center* at Penn State. This will include a new faculty position in tree genetics at the Mont Alto technical forestry school campus, a post-doctoral fellowship for young scientists to join *The Schatz Center* for two to three year appointments, support for visiting scholars to work with Penn State faculty in *The Schatz Center*, awards for undergraduate students to conduct research in *The Schatz Center*, a biannual colloquium where scientists from around the world can present their latest research findings, and new library collections relevant to forestry and tree genetics. The Schatz Center gifts will also support construction of the new Forest Resources building on the University Park campus. Detailed plans (see floor plan on the last page) are now being developed for the new building, which includes research lab space of over 2,000 square feet plus offices for *The Schatz Center*. We look forward to Schatz family members attending the opening of the new building in 2005. Until then, *The Schatz Center* continues to enjoy high quality research space within the Biotechnology Institute building (the "Wartik Lab") on the University Park campus.

Dr. Carlson serves as Director of *The Louis W. Schatz Center for Tree Molecular Genetics*. Dr. Carlson reports to the Director of the School of Forest Resources, Dr. Charles Strauss, and to the university President's office regarding finances and activities in the center. Dr. Carlson looks forward to fully implementing the *Schatz Center's* structure and staffing beginning in July of 2003.

### Projects currently underway in *The Schatz Center*

Dr. Carlson's research grants (awards) support several projects, including associated staff and students, in the *Schatz Center*. Our research efforts cover a wide range of research activities such as tissue culture, conservation genetics, genetic diversity, and tree genomics:

- A multidisciplinary study, along with ecologists and plant physiologists, to better understand the role of animals in regeneration of oak forests, funded by the National Science Foundation.
- A project to clone and characterize genes that are responsible for lignin synthesis during the creation of wood in trees, funded by the Department of Energy Biosciences Research Program.
- Experiments to develop tissue culture protocols to propagate more uniform Christmas tree seedlings, funded by the PA Department of Agriculture.
- We are using molecular genetic techniques to assist the American Chestnut Foundation to develop blight resistant American chestnut trees that can be reintroduced into native forests and into nut growers orchards in the US.
- Studies are to determine the role of various genes in the response of maple trees to toxic levels of Manganese in the soils of Eastern forests. This study is funded by the US Department of Agriculture.
- *The Schatz Center* is participating in a project of national scope, initiated in 2002, to create the large libraries of the genomes of various plants as a resource for molecular genetics research. *The Schatz Center* is in charge of the woody plants for the project, including yellow poplar. The project is funded by the National Science Foundation.
- *The Schatz Center* is a key participant the "Floral Genome Project", funded by the National Science Foundation to Penn State and colleagues at five other universities. In this project we will discover the genes responsible for the development of flowers. *The Schatz Center* will sequence over 50,000 genes from flowers in a wide variety of plant species. This data will provide unique insights into flowering in trees, and provide new approaches for controlling flowering via biotechnology.

### The Louis W. Schatz Endowment for Undergraduate Research

Students in the School of Forest Resources Xi Sigma Pi honor society chapter assisted Dr. Carlson to prepare a planting site in the university's

research forest for planting new populations of chestnut seedlings in 2003 and 2004. The Xi Sigma Pi students will help plant the offspring from new crosses that Dr. Carlson is conducting between blight sensitive American Chestnut trees and blight resistant Chinese chestnut trees. Once the new seedlings are established we will monitor them for the blight disease and use create a new genetic map. Students who participate in the chestnut seedling project will be supported by Schatz Center funds to travel to California to meet forestry students and staff at Humboldt State University and hopefully to tour the research forest with Mr. Gordon Schatz.

#### Recent publications from the Schatz Center for Tree Molecular Genetics:

- Fu, Y. B., A. Phan, J.C. Carlson, and K.W. Richards. Assessment of bulking strategies for RAPD analyses of flax germplasm. Accepted by Genetic Resources and Crop Evolution, May 15, 2002.
- Amarasinghe, A. and Carlson, J.E. 2002. The Development of Microsatellite DNA markers for genetic analysis in Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) Canadian Journal of Forest Research, 32(11): 1904-1915.
- Amarasinghe, V., Brown, G.R., Mank, J.E. and Carlson, J.E. 2002. Microsatellite DNA loci for Western Hemlock (*Tsuga heterophylla* (Raf.) Sarg). Molecular Ecology Notes, 2: 236-238.

#### Recent Presentations on research conducted in the Schatz Center:

- Annual Meeting of USDA Multistate Research Project (NE140) on American Chestnut Improvement, Ivoryton, CN, October 25, 2002
- “The Floral Genome Project” Poster at Plant and Animal Genome Conference X, San Diego, CA, January 12-16, 2003.
- “Behavioral decisions of food-hoarding mammals and the oak dispersal syndrome: An overview.” Upland Oak Ecology: History, Current Conditions, and Sustainability Symposium, Fayetteville, AR. Oct. 8-10, 2002.
- “The Floral Genome Project”, Botany 2002 Conference, Madison, Wisconsin, August 2-7, 2002
- “Gene Discovery in Cocoa using Cotton and Arabidopsis DNA Databases” American Society of Plant Biology annual meeting, Denver, Colorado, August 3 - August 7, 2002
- “Determining relationships between oak seedlings and adult trees in native forests by DNA fingerprinting “ American Society of Plant Biology annual meeting, Denver, August 3 - 7, 2002