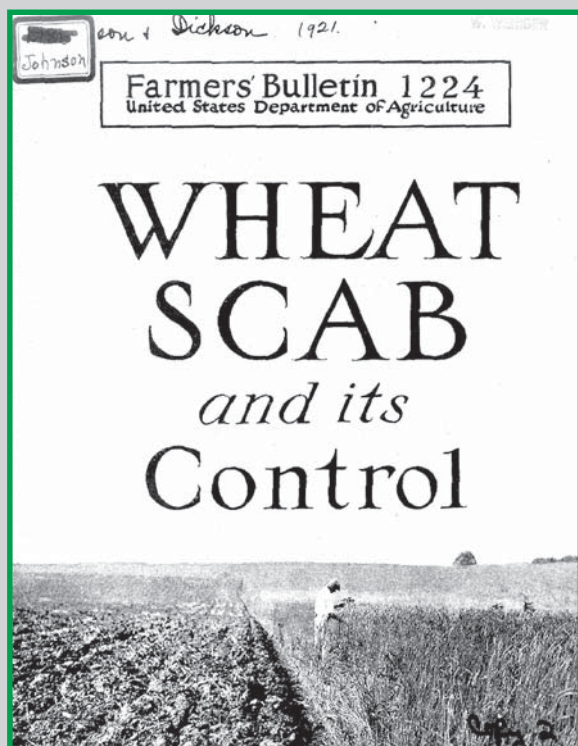


Aurora Sporealis

The Alumni News Magazine of Plant Pathology

DEVASTATING DISEASES



OAK WILT: ITS SIGNIFICANCE, SYMPTOMS, AND CAUSE^{1,2}

BERCH W. HENRY, C. S. MOSES, C. AUDREY RICHARDS,
AND A. J. RIKER

(Accepted for publication January 4, 1944)

Agriculture

Science, Dec. 2004

Plant Pathologists Gear Up for Battle With Dread Fungus

No soybean can resist a rust that has finally arrived in the United States, spurring a search for new varieties, predictive models, and monitoring techniques

PLANT PATHOLOGY

Science, March 2004

Nurseries May Have Shipped Sudden Oak Death Pathogen Nationwide

*Meeting the challenge of recurring
and emerging threats to plant health
in agriculture and natural systems*

2005

UNIVERSITY OF MINNESOTA

Greetings from Minnesota!

Dear Alumni and Friends,

Greetings! As I write my first letter for the *Aurora* as Department Head of Plant Pathology, I am filled with gratitude for everyone's support and encouragement this past year. After reading over previous letters composed by our former Department Head, Frank Pflieger, who retired from the University in October 2004 after 31 years of service, the task of writing this letter appeared daunting. His highly informative letter conveyed many thoughtful insights into the workings of the University, College and Department. With considerably less experience under my belt, 11 months and counting, I'll provide a brief snapshot of some of the more recent events in the department.

This has been a year of tremendous change, both for me personally and for the University, especially the College of Agricultural, Food and Environmental Sciences (COAFES). I'll first mention some of the personal aspects. As some of you are aware, I moved from Colorado State University in sunny Fort Collins, Colorado, to the Twin Cities in mid-



October 2004, and began my term as professor and head on November 1. My husband Dan stayed back in Colorado to sell our house and to see to the relocation of his father to Seattle. I rented a modest apartment in St. Paul (having the extremely attractive feature of an underground heated parking lot!), and began learning my way around the Twin Cities and campus. This seemed to take an inordinate amount of time. I remember feeling especially proud the day I finally mastered the Gopher Way, the extensive tunnel system connecting most of the buildings on the Saint Paul campus, by navigating all the way from the Gortner parking lot to the departmental office in Borlaug Hall. Dan joined me in St. Paul at the end of May and recently began working in the gifted and talented program in the Robbinsdale school district.

Presidential Strategic Planning Initiative. In several respects, the changes taking place at the University dwarf my personal transition. As many of you are aware, the University began a major strategic planning initiative in the summer of 2004, when President Robert Bruininks created a system-wide coordinated strategic positioning process for elevating the University to even higher levels of achievement. Recommendations from the first wave of planning were reviewed and approved by the Minnesota Board of Regents in June 2005. The University resolved to become one of the top three public research universities in the world within a decade. Several of the report's recommendations are transformational and directly impact COAFES. For those of you who would like more information on the strategic planning process and recommendations, I encourage you to visit www1.umn.edu/systemwide/strategic_positioning/index.html.

New College. I will focus on one area having the greatest potential impact on the Department. The Board of Regents approved the recommendation that COAFES and the College of Natural Resources (CNR) merge to create a new expanded college. The name, mission, and structure for the new college, or New-Co, as it is being referred to, will be determined within the next year. President Bruininks has charged a task force led by Deb Swackhamer, co-director of the Water Resources Center; Ron Phillips, Regents Professor and McKnight Presidential Chair in Genomics; and Al Levine, head of the Department of Food Science and Nutrition, with developing a plan for the New College by December 2005. To assist the task force and the colleges during this transition, Deans Charles Muscoplat, COAFES, and Susan Stafford, CNR, have recruited volunteers for some 20 working groups, which will be responsible for providing guidance on a wide range of topics including departmental structures, capital planning, and curricular issues. For the latest news on the New-Co Transition, please visit www.newcollege.umn.edu/Transition.

This is an exciting time for the University and the Department. Your input into the process is important. If you would like to provide comments to the Task Force, please visit www.newcollege.umn.edu/Comments.

Departmental office renovation. A slightly less monumental, but still very exciting change was the renovation of the departmental office. Over the holiday break, the staff and I took up space temporarily in 491 Borlaug, while the main office in 495 was gutted and repainted. New data lines, carpet, and office furniture completed the look. We're still trying to figure out where to hang artwork. The office has a cheerful and welcoming feel. With the open floor plan, there are more opportunities for casual interactions among faculty, students and staff. Visitors are always welcome!

Traditions. With all the changes taking place at the University, longstanding departmental traditions have provided a much-valued anchor throughout the year. Professor Larry Madden, Department of Plant Pathology, Ohio State University, Wooster, OH, received the 2005 **E. C. Stakman Award**. He is an ideal example of the kind of individual Dr. Stakman had in mind when the award was established in 1955. He intended it be granted to individuals of any country and nationality for outstanding achievements to Plant Pathology in the areas of research, teaching, outreach, and international development or for any combination of these areas. Dr. Madden received his award and presented a seminar on "Contemporary Approaches to Plant Disease Forecasting" in mid October 2005.

The Distinguished Alumnus Award for 2005 was presented to Professor George Hudler, Chair of the Plant Pathology Department at Cornell University in Ithaca, New York. George grew up in the forest product town of Cloquet, Minnesota. He received his BS in Forestry (1970) and his MS in Plant Pathology (1973) from the University of Minnesota. During his MS work on seed dispersal of dwarf mistletoe, he became fascinated by the fungi. George's enthusiasm for fungi was fueled by the humor and teaching style of Clyde Christensen (Regent's Professor of Plant Pathology) who taught Introduction to Mycology, and by his advisor David French. George visited the Department in October to give a seminar and receive his award.

Early in the year the University announced that Dr. Paul Sun of Taiwan was selected to receive the **Distinguished Leadership Award for Internationals**. Nevin Young nominated Dr. Sun for the award. Professor Sun is one of the top agricultural leaders in Taiwan and received a master's degree in plant pathology from the Department in 1966. An award ceremony honoring Dr. Sun was held in October in the Cargill Building.

The results of the **Annual Stakman Softball Game** are in: Students 6 - Faculty/Staff 11. Each side played tough, but even with the help of a walk-on ringer (Dan Ishimaru), the students weren't able to counter a third inning, 8 run onslaught by the faculty/staff. The weather was perfect softball weather: sunny and in the 70's. After the game, we headed back to Borlaug where staff and volunteers prepared a terrific barbeque of brats, burgers, and hot dogs. "Coach" Amar Elakkad, accepted the game trophy on behalf of the Faculty/Staff team, and the Students vowed a comeback next year. This was my first Stakman game, and I couldn't have enjoyed it more. I look forward to another next year!

New Faculty welcome. Dean Malvick joined the faculty in August 2005 as an Assistant Professor. His primary responsibility is extension for row crop pathology. His arrival couldn't have been timelier in light of heightened concerns about the possible spread of Asian soybean rust into Minnesota. Dean will also chair the Minnesota Soybean Rust Task Force, which is an interagency working group representing the Minnesota Department of Agriculture, University, and Minnesota Soybean Growers. Our best wishes to Dean and his wife Kimberly Hill, who also joined the University in September as a faculty member in the Department of Civil Engineering.

Transitioning Faculty. In late summer 2005, Dr. Janna Beckerman resigned her position as Extension Plant Pathologist to assume a tenure track Assistant Professor of Plant Pathology position in Purdue University. Janna will be responsible for extension and research activities related to diseases of landscape ornamentals, greenhouse disease management, and small/tree fruits. I am grateful for Janna's many contributions to the Department and know you will join me in wishing her much success in her new position.

Special students. Once again, the plant pathology graduate students hosted a very impressive and successful symposium. This year's theme was "The Role of Plant Pathogens in Natural Ecosystems." I was so proud sitting in the audience and watching these young professionals. We can be confident that our discipline will be well served by this next generation of scientists.

One student deserves special note. James Jacobs, a member of the Wisconsin National Guard, was called to serve in Iraq. James left the department in June 2005, and will likely be away for 18 months. James' major professor, Bob Blanchette printed a poster for people to sign to let him know we will be thinking about him. We look forward to his safe return.

In gratitude. I am grateful to all who have patiently guided and sometimes rescued me during this year - one student in particular literally found me lost in the Gopher Way and was kind enough to lead the way to the student center! I especially thank Carol Anderson and Ann Arendt for their patience and assistance. With their highly professional and light hearted, can-do attitudes, this transitional year went as smoothly as one could hope. They are worth their weight in gold!

I extend my sincere thanks to Frank Pflieger for his mentorship this past year, and for his fiscal vision, which has left the department on sound financial footings. Last year he encouraged you to support the **E. C. Stakman Graduate Student Fellowship Endowment**. It is through the generosity of our many alumni and friends that the department continues to provide graduate student assistantships in plant pathology. Perhaps more than ever, gifts from alumni and friends play a significant role in our ability to fund graduate education. State appropriations to the University continue to decline, and this year we witnessed a presidential movement to eliminate federal formula programs for agricultural research. While we at the University will continue to meet these challenges, you can also help. I encourage you to contribute to the **E. C. Stakman Graduate Student Fellowship Endowment** or an endowment of your choice. In so doing, you directly influence the future of plant pathology at the University.

It is a privilege to come to work each day and work with the fine faculty, staff and students of this department. I will continue to do my best to carry on the legacy that has made this a world-class department.

My best wishes to you for the coming year.

Sincerely,

Carol Ishimaru

Devastating Diseases Aurora Sporealis 2005

In this Issue

This year the University, the College, and the Department initiated changes to help us meet the challenges of the 21st century. What is not changing is the overall mission of Plant Pathology. We will continue to do innovative research. We will continue to provide information on sustainable disease management vital to a broad clientele—agricultural producers, foresters, historical preservationists, and home gardeners, among others. We will continue to provide high quality graduate education. In short, we remain committed to making a positive difference in the lives of people in Minnesota and around the globe. As described in our cover story, in these times of extensive world trade and travel, it is critical to have scientists trained to respond to recurring and emerging diseases that threaten agricultural and native plants.

We hope you enjoy reading about the accomplishments of the Department during the past year. We are proud of the work of our graduate students, the research we do to meet needs of producers in the Midwest region, and international research projects that benefit people in distant parts of the globe. Please consider donating to our endowment funds so that this important work can continue.

Deborah Samac
Editor-in Chief

New Sights on Campus



New entry to Horticulture display garden.



Entry to the MAES/MDA plant growth facilities.



Headhouse with classrooms, laboratory and work space for the renovated plant growth facilities.



Entry into the renovated greenhouse facilities.

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DEVASTATING DISEASES: THE CONTINUING BATTLE AGAINST OLD AND NEW ENEMIES

By Deborah Samac, Jim Kurle, Bob Blanchette, Jason Smith, Jennifer Juzwick, Charla Hollingsworth, and Ruth Dill-Macky.

In 1947 E. C. Stakman observed, “Plant diseases are shifty enemies” (1). This statement is as true today as it was then. During the nearly 100 years of plant pathology research at the University of Minnesota, tremendous progress has been made in identifying and controlling plant diseases. We have also gained an understanding of the biology underlying the mechanisms of pathogenesis and disease resistance, the influence of environment on pathogens, and the ecology of microorganisms associated with plants. Nonetheless, agricultural producers, horticulturalists and home gardeners in Minnesota and around the world are still besieged by plant diseases that devastate their crops and destroy their livelihoods. Faculty members in Plant Pathology are dedicated to doing the research to find the means of combating the recurring and new diseases that threaten our crops, forests and gardens.

U of M Plant Pathologists Respond to the Threat of Asian Soybean Rust

With the introduction of Asian Soybean Rust into the United States, plant pathologists in Minnesota and throughout the United States were confronted with another invasive plant pathogen. Soybean rust, caused by the fungus *Phakopsora pachyrhizii*, is a major threat to soybean productivity. It is disseminated by airborne spores, possesses enormous reproductive potential, and can cause devastating damage to soybean crops. Originally identified in Japan in 1905, the disease has spread throughout soybean producing areas in Asia, Africa, and, recently, South America. Following its first appearance in Paraguay in 2001, within three years soybean rust spread throughout the soybean producing areas of Brazil and Argentina where it has caused yield losses as high as 80%. In November 2004 Asian Soybean Rust was found by plant pathologists on soybeans in Louisiana. Follow-up surveys resulted in the discovery of soybean rust on soybean and kudzu, a susceptible weedy alternative host, found throughout seven other Southeastern and Gulf Coast states.

Fortunately for soybean growers in Minnesota and other major soybean growing states, the spread of soybean rust was limited by unfavorable winds and weather conditions. By mid-September 2005 its occurrence was limited to Alabama, Florida, Georgia, Mississippi, and South Carolina where it had caused limited yield losses in some areas. Probably as important a yield loss was the added cost of fungicide application made for its control in these states. In addition, because soybean rust has become established in the southern United States and the Caribbean, the potential exists each growing season for spread into the north central U. S. if favorable weather conditions occur.

The University of Minnesota Department of Plant Pathology responded in both state and regional efforts to the threat posed by the introduction of soybean rust. Department Head **Carol Ishimaru** organized and chaired the Minnesota Soybean Rust Task Force, a collaboration of the University of Minnesota, the Minnesota Department of Agriculture, the Minnesota Soybean Research and Promotion Council, and representatives from the state agricultural industry. The task force coordinated communication, extension and outreach activities, and research efforts in response to the threat. **Jim Kurle, Sagar Krupa, and Les Szabo** collaborated on research projects directed toward early detection of soybean rust spores deposited in rainfall and the development of a disease forecasting system for early disease detection. University faculty from several departments including Plant Pathology, Agronomy, Entomology, and Regional Outreach Centers also collaborated in research on fungicide application, efficacy, and “off-target” effects focused on fungicides that would be applied to control soybean rust. Their research was funded by grants from USDA, soybean growers, and the Minnesota Rapid Agricultural Response Fund. Additional research involved the use of molecular techniques to detect soybean rust spores in rainfall samples collected nationally through the National Atmospheric Deposition System and in Minnesota at sentinel plots organized by **Crystal Floyd** who also provided diagnostic support. The sentinel plots were an essential component of a nationwide system of soybean plantings monitored for the occurrence of soybean rust. **Char Hollingsworth, Dean Herzfeld, and Jim Kurle**, assisted by local and regional extension educators, developed and delivered numerous extension and outreach programs for producers, consultants, and agriculture professionals. They also trained “first responders” to distinguish soybean rust from foliar disease “look-alikes” that could be mistaken for soybean rust. **Dean Malvick** assumed the chair of the task force and joined the research and outreach effort when he assumed responsibility as extension row crops pathologist during mid-summer. The Minnesota sentinel plot effort also provided input to a nationwide reporting program coordinated by USDA, supported by university plant pathologists and the efforts of commodity groups. Information was made available on websites, by phone, and through media outlets. This was a true collaborative effort that brought together the expertise of individuals from the Department of Plant Pathology, Minnesota State Climatology lab, and modelers from the Illinois Water Survey.

Fortunately, for producers in the upper Midwest, soybean rust remained only a threat in 2005. However, preliminary results of our research suggest that soybean rust may behave like the rusts of small grains. Potential sources of inoculum are present in areas around the Caribbean and in the southern United States. Now that soybean rust is established in those areas, soybean rust will always be a threat whenever the proper wind and weather conditions occur.

Sudden oak death causes devastation in North America

“Plant disease situations often have shifted in the past because man, either through ignorance, apathy, or ineptitude, has transported plant pathogens in or on propagative parts of plants or plant products, from locality to locality, region to region, and continent to continent.” E.C. Stakman, 1947

Sudden oak death, caused by the oomycete *Phytophthora ramorum*, is a devastating disease of oaks in California and was first

found and described in the U. S. by alumnus **David Rizzo**, Professor in the Department of Plant Pathology, University of California, Davis. The disease is causing catastrophic losses of oaks and tanoaks in California coastal landscapes and is responsible for the destruction of over a million nursery plants. It has spread from California, primarily on nursery stock, to 22 states. It has also been found in 400 nurseries in 13 countries in Europe and more than 20 nurseries in Canada. The \$2.1 billion nursery and landscape industry in Minnesota is deeply concerned about this new disease and its potential to cause devastating losses resulting from strict quarantines and massive eradication efforts. The highly valued and ecologically important oak population in urban landscapes and forests of Minnesota could also be at great risk from this disease if it is introduced. With funds from the Minnesota Agriculture Rapid Response Fund, surveys and research are underway in **Bob Blanchette's** lab (in cooperation with the U.S. Forest Service, APHIS and Minnesota Landscape and Nursery Association) to determine what species of *Phytophthora* are present in nurseries. For many years *Phytophthora* species have taken a large toll on woody ornamental production but little to nothing was known about the species present and how best to control the problem. Although surveys did not find *P. ramorum* in the state, a previously unreported species to the United States, *P. hedraiondra*, was found. Other species found include *P. cactorum*, *P. cambivora*, *P. citricola*, *P. citrophthora*, *P. fragariae* var. *rubi*, *P. gonapodyides*, *P. megasperma*, and *P. nicotianae*. Graduate student **Brian Schwingle** is working on this project to characterize the species obtained and better understand the biology of *P. hedraiondra*. His results will assist in determining how best to implement controls for *Phytophthora* diseases in Minnesota nurseries.

Persistence of Dutch Elm Disease and Oak Wilt in Minnesota

“Many plant diseases are insidious and inscrutable. Their performance in their native country is not necessarily an indication of what they will do in a new region.” E. C. Stakman, 1947

If you stroll through the State Fair Grounds in St. Paul or drive through the older neighborhoods in the Twin Cities, the loss of stately American elm trees to Dutch Elm Disease (DED) is very apparent. The tree-lined streets with branches arching overhead are now just a memory. During the past few years we have witnessed a resurgence of DED and the rapid loss of old trees once thought to have escaped the epidemics. The heavy toll from DED is due, at least in part, because of weather that has favored bark beetle reproduction, from delayed removal of infected trees allowing inoculum increase and facilitating spread of the fungus, and growth of elm shoots in woodlots and easements. These “feral” elms serve as sources of inoculum that are difficult to eliminate. Thus, DED continues to plague urban forests in the Twin Cities area.

The adaptability, durability and fast growth of elms makes them ideally suited to landscape use. Despite their potential susceptibility to DED, urban foresters are interested in maintaining elms in the urban forest and new elms are being planted (for example in Uptown and along avenues near downtown Minneapolis many new elms were planted this year). However, most of the new elms are hybrids between American elms and Asian species. These hybrids lack the distinctive crown characteristics (vase shape) of American elm. Thus, there continues to be strong interest in developing DED-resistant American elms. Several DED-resistant cultivars exist, however, they are only available in limited numbers and some suffer from poor growth characteristics. **Mark Stennes**, a department alumnus currently working for J & J Tree Service has recently identified a large beautiful American elm near the St. Croix River in Minnesota. Despite its proximity to many infected trees and abundant inoculum, this tree remains disease-free. With the help of the **Jason Smith** and Jeff Gillman and Chad Giblin in the Department of Horticultural Science, this tree has been propagated and will be inoculated to thoroughly test for DED-resistance in coming years. This tree has tentatively been given cultivar status and named *Ulmus americana* ‘St. Croix’. Jeff Gillman and Chad Giblin have also propagated other elms for testing and evaluating for urban landscape use. There are many other trees such as ‘St. Croix’ in Minnesota (one magnificent tree that is easily seen is just north of I-94 on Dale St. in St. Paul) and these trees have potential for providing breeding material for future DED-resistance. One must remember that working with trees requires plenty of patience due to the time needed. However, the seeds are being planted now for future generations to enjoy American elms as we have.

Oak wilt, first reported in Minnesota in the early 1940's, has had less publicity but is an equally devastating disease. The disease is found from Pine County in east central Minnesota to the southeastern part of the state. Based on Minnesota Department of Natural Resources data, there were more than 12,000 infection centers in 20 Minnesota counties in 2002. About half of these centers had received some level of control activity. Tens of thousands of oaks die from the disease every year. The highest density of oak wilt in the state occurs in Sherburne County (northeast of the Twin Cities metro area) with more than 30 acres of infected oaks per square mile.

Why has the disease “intensified” and spread in some areas? First, there is substantial home, office, retail, and industrial building construction occurring in wooded areas. Construction can easily result in unintentional wounding of trees, including oaks. Spread of the causal agent by insects can occur when fresh wounds are visited by pathogen-contaminated sap beetles. Seasonal dispersal of the pathogen by the main sap beetle vector species is greatest from early April through early July. Secondly, Minnesota often experiences severe weather events during the spring of the year. Wind damage to trees promotes fresh wounds that attract sap beetle vectors. In either of these scenarios, new infection centers are a result of successful transmission of the fungus by these insects.

Research on oak wilt in Minnesota involves University, USDA Forest Service and the Minnesota Department of Natural Resources. **Jennifer Juzwick** along with collaborators Roger Moon, Bruce Moltzan, and Dave Appel and graduate students **Ryan Blaedow** and **Maya Hayslett** have research projects focused on the identification of principal sap beetle vector species, seasonal dispersal of the oak wilt fungus by sap beetle species and are evaluating the efficacy of propiconazole, a systemic chemical treatment, for control of the disease. In addition, a local company, Rainbow Scientific Advancements, is conducting several trials on systemic chemical control of the disease in oaks led by alumnus **Shawn Bernick**, and is contributing to studies being conducted by the USDA Forest Service and Department of Plant Pathology. We won't eradicate the disease, but it is possible to keep it at a “manageable level” with consistent suppression efforts. Unfortunately, not all communities with the problem have developed management programs. Ongoing research will help to provide economical and effective management options for communities throughout the oak forest range in Minnesota.

Impact of recurring epidemics of *Fusarium* head blight (scab) of wheat and barley

“There is therefore an unholy alliance between the scab fungus and corn.” E. C. Stakman, 1947

Fusarium head blight (FHB) or scab is a fungal disease that E. C. Stakman and J. J. Christensen were very familiar with. The first recorded epidemics in Minnesota were during 1905 and 1907. During 1915, FHB was again severe. Progress in one area had resulted in the creation of new problems. At the turn of the century, the development of early maturing varieties of corn permitted the expansion of the cornbelt approximately 500 miles northward into the upper Mississippi Valley. This crop created a new hazard for wheat and barley, because the fungus that causes head blight over-winters well on corn stalks and stubble. Unfortunately, high-yielding small grain varieties susceptible to the disease were widely grown. Epidemics of FHB undoubtedly led to the disappearance of barley in southern Minnesota.

Since the early 1990's FHB epidemics have again resulted in huge crop losses in northwestern Minnesota and the eastern part of the Dakotas. Weather and local agricultural practices combined to influence and increase the frequency of FHB outbreaks. FHB epidemics changed the structure of the Red River Valley agricultural community. The current resurgence of the disease started in 1992 following a wet fall, which hampered fall tillage operations. This left *Fusarium*-infested residues on the soil surface and set us up for a disaster in 1993 when yield losses to the Minnesota wheat crop was estimated at 33%. FHB has been a continuing problem since then and 2005 was possibly the worst year since 1993. In addition, conservation tillage practices have resulted in a greater inoculum load. It is interesting to note that the move to conservation tillage started in the mid-1980's when the Red River Valley was experiencing drought conditions. FHB resurged when summer rainfall totals were above average in the early 1990's. One of the biggest impacts of the FHB epidemics has been the loss of barley acreage. Barley production in the state has all but collapsed. Barley has gone from about 875,000 acres in the early 1990's to approximately 120,000 acres in 2005. Only the most progressive growers can achieve malting quality, and that occurs in years free of FHB epidemics. As small grain crops decrease, soybean and corn production continues to advance to the Canadian border. Since 2003, Polk County in northwestern Minnesota has taken the lead for greatest number of soybean acres in the state.

Wheat and barley breeders have been working for a number of years to deliver FHB-resistant varieties. While varietal resistance in barley remains elusive, there are commercially available hard red spring wheat varieties that have moderate resistance to FHB. While one resistant variety is widely grown in northwest Minnesota, its yields are low when compared with FHB susceptible varieties in non-epidemic years. The disease represents a sporadic production problem. The number of acres planted to susceptible varieties increase as the number of growing seasons increase between severe FHB epidemics. This repetitive cycle of producer “optimism” sets the stage for widespread FHB epidemics - much like what occurred this year. Many producers planted susceptible, high yielding spring wheat varieties that were severely diseased. Preliminary wheat loss estimates (yield and quality) for 2005 range from 0% to 50% in the state. As long as disease resistant varieties deliver low yields and/or protein levels, Minnesota producers will plant susceptible varieties. This makes identifying effective disease management strategies even more important. We cannot yet rely on resistant varieties alone.

The FHB disaster has resulted in the formation of a collaborative research team at both the state and national levels. In the Red River Valley, each year spring wheat and barley lines are evaluated for resistance to multiple diseases. **Charla Hollingsworth** (Extension Plant Pathologist), Galen Thompson (NW Minnesota Disease Nurseries Coordinator), and John Wiersma (Agronomist) support inoculated wheat and barley tests at the Northwest Research and Outreach Center in Crookston. **Brian Steffenson, Ruth Dill-Macky**, Jim Anderson (wheat breeder), and Kevin Smith (barley breeder) collect disease severity data from the tests for use in the production of resistant varieties. In 2005, more than 10,000 wheat and barley lines were evaluated. Char Hollingsworth also conducts FHB uniform fungicide trials on winter wheat, spring wheat, and barley. This research is part of a multi-state cooperative effort to determine the efficacy of experimental chemical products on FHB on wheat and barley. An emergency exemption was granted again during 2005, by the U.S. Environmental Protection Agency, to allow Minnesota wheat and barley producers to apply ‘Folicur’ fungicide for FHB management. In another multi-state research project, aerial application methods for fungicides on wheat are being tested for improved control of FHB. Char Hollingsworth conducts on-farm disease management trials at several locations in the Red River Valley to establish efficacy and performance data of disease management practices. Producers need disease management recommendations that are tailored to variety, local environment and crop yield potential. This data will likely reduce the number of prophylactic fungicide applications that producers are making, increasing the crop's economic viability.

There is a large collaborative effort in St. Paul on FHB supported with funding from both state and federal initiatives. This work supports the efforts of the plant improvement programs of Jim Anderson and Kevin Smith and work on the identification of new and novel sources of resistance including the development of transgenics being done by **Ruth Dill-Macky, Yue Jin**, Gary Muehlbauer (Agronomy and Plant Genetics), and **Brian Steffenson**. There are studies on the genetics and genomics of the host by Gary Muehlbauer and Dave Garvin (USDA-ARS) and genomics of the pathogen by **Corby Kistler**. Epidemiological research and studies examining cultural control practices are being done by Ruth Dill-Macky's small grains pathology group. Many of the St. Paul faculty work in close collaboration with the faculty in the Red River Valley. Given the shifty nature of the plant pathogen and lack of immunity in wheat and barley, this disease is likely to recur in the future. However, current research will enable us to reduce the frequency and intensity of future epidemics.

Stakman's perspective on the role of science in society.

The increasing amount of world travel and trade will increase the vulnerability of our crops and native plants to infection by introduced pathogens. New diseases will also emerge due to climate change and pathogen evolution. We must continue our efforts to promote sustainable production of healthy plants and train scientists to continue in the footsteps of Stakman and other visionary scientists. As Stakman stated, “It should be the function of science not only to interpret what has happened in the past and explain what is happening in the present but also to predict what may happen in the future and be prepared to meet future emergencies before the future has already become the past.”

1. Stakman, E. C. 1947. Plant diseases are shifty enemies. *American Scientist* 35:321-350.

Featured Alumni

Ernesto Moreno Martínez (Ph.D., 1969)

I obtained my Ph.D. in June 1969, under the direction of Dr. Clyde Martin Christensen. I met Dr. Christensen in 1962 during one of his research stays at the Instituto Nacional de Investigaciones Agrícolas in Mexico, to which he was invited by Dr. John S. Niederhauser from the Potato Program of the Rockefeller Foundation. Dr. Christensen took me on as his student for my Master's degree in Mexico, working on maize storage.

In 1966, Dr. Elvin C. Stakman and Dr. Niederhauser informed me that I was a recipient of a Rockeller Foundation Fellowship to study at the University of Minnesota in the Plant Pathology Department with Dr. Christensen as my advisor. I knew hardly any English. However, Dr. Niederhauser told me, "You have to go. Do not take the English test; rather, show up there, that is all, and don't tell them that I told you to do so." So I said, "Okay, Dr. Niederhauser, I will go." I arrived at Minnesota in the summer of 1966, and began work in Lab 201 in what is now Stakman Hall.

During the first summer, at a Thursday Night Seminar, I was introduced to the students and professors attending the seminar. Hemant Fanse, from India, helped me with my short speech (thirty seconds) that I had learned by heart. When I heard them call my name, I stood up and started my speech "I am very happy to be here and I hope...". I felt so happy after my first experience using English. At the beginning of the Fall quarter, however, I had to take the TOEFL test as well as the University English test, both of which I flunked.

During my first quarter, I took two plant pathology courses and an English course on the Minneapolis campus. I got A's in all courses, and they decided that my English was good enough. I still fear the TOEFL test to this day.

That was my start in the Department. It was hard work all the time, but the effort was worthwhile since the Department had a great staff of Professors, including Mathew Moore, Neil Anderson, CMC, Chester Mirocha, Ernest Bantari, Carl Eide, Thor Kommedahl, Roy D. Wilcoxson, Bill Kennedy, and David French, who always left a mushroom each evening on the top of the students' desks to be identified (we had to take the mushroom with proper identification to him in his office when leaving the Department at night) – this was nice training from a very nice Professor.

Before coming to Minnesota, I was already linked to the Plant Pathology Department by having had Professors for my undergraduate studies who had obtained their degrees there (e.g., Gabriel Murillo who got his M.S. under Dr. Stakman, J.J. Christensen and Lorenzo Martínez who received his Ph.D. under Dr. Hayes of the Plant Breeding Department). Dr. Hayes also took Plant Pathology courses, and he was a great fan of Matt Moore. Through them, I was aware of the important findings of Dr. Flor, the gene-for-gene theory, and Dr. Stakman's understanding of physiological rust races, knowledge which eventually led to effective breeding for resistance. I was already familiar with his work, having taken the course of Principles of Plant Pathology from Dr. Stakman during my Master's degree studies at Colegio de Postgraduados in Chapingo, Mexico.

After I left Minnesota, I joined the Research Staff of the National Autonomous University of Mexico (UNAM) in the Biology Institute. I stayed with that Institute for 30 years, doing research on grain and seed storage, mainly with problems caused by storage fungi and mycotoxins. In relation to this, I think I may be the last student of CMC working on these types of problems since John Tuite, a former student of Christensen's, died a few years ago. In 1982, I visited John at Purdue. I spent a wonderful summer with him, where I wrote the draft of what was to become a book entitled, *Biological and Physical Analysis of Agricultural Seeds* (in Spanish). I have always been in contact with Dave B. Sauer, another former CMC student. Dave retired a few years ago from the USDA Grain Marketing and Production Research Center, in Manhattan, Kansas, and I do not know of other Minnesotans working in this area.

In 1989, I became the founder and Head of a grain and seed research laboratory "Unidad de Investigacion en Granos y Semillas" (UNIGRAS) at the Biology Institute of UNAM. This lab was moved to the Facultad de Estudios Superiores Cuautitlan, UNAM where I continue my research as Laboratory Director.

I have had several academic-administrative positions without leaving research. In 1974 I was commissioned for two years by my University to the School of Agriculture ("Antonio Narro") in Saltillo, Coahuila to help with the transformation of the School into an Agrarian University. I became the first General Secretary of the Universidad Autonoma Agraria Antonio Narro. At the end of my commission, I returned to research at UNAM, and was appointed Head of the Botany Department; and later Academic Secretary, both positions at the UNAM Biology Institute.

In 1993, I was appointed Director of the University (UNAM) Food Program, a position I held for four years before moving to FES-Cuautitlan (UNAM) where I continue to work on storage fungi and mycotoxin problems. Currently, I am working on a research project on traditional plant breeding in conjunction with molecular biology to develop maize lines, hybrids and varieties with special characteristics such as high vigor and long longevity seeds, plants resistant to drought and salinity. In addition, we are identifying other special characteristics in maize plants that offer protection from invasion of *Aspergillus flavus* and the production of aflatoxins through the development of vigorous plants and grains and seeds. As I learned more than 37 years ago, it is difficult to breed for resistance against a weak parasite, since *Aspergillus flavus* is not like *Puccinia graminis tritici*. Over the past thirty years, U.S. maize breeders have erroneously been trying to conduct their breeding program in a manner similar to that of wheat breeders who have performed successfully with *Puccinia graminis tritici*. Now, it seems that the maize breeders are finally taking the correct approach, utilizing plant pathologists on their working teams. The practical grain and seed research we have been conducting has yielded positive results for seed companies and grain warehouses here in Mexico, as well as for the training of their technical personnel. We have been doing basic research that is now being applied to maize breeding.

I am convinced that the formative years I spent in Minnesota instilled a life-long way of thinking about plant pathology in such a way that I have been able to confront grain and seed problems through my research, at the same time to effectively convey this knowledge to many students over the years, at both the undergraduate and graduate levels.

Believe it or not, I miss the Minnesota winters — the last one of 1968, we had temperatures 48° F below zero. Do you believe me?

Dr. Richard Morrison (M.S., 1968; Ph.D., 1972)

Even though I have not kept in very close contact with the University of Minnesota Plant Pathology Department over the years, I always look forward to receiving the *Aurora Sporealis* with its news about the Department, former classmates, and various goings-on. I saw in the 2003 edition that my name was listed as an “old timer” who would like to be heard from. Although this note is a bit tardy, it is a chance to share some of my professional experiences and recollections of time spent in Minnesota.

When I began graduate school in the Plant Pathology Department in fall 1965, the revered J. J. Christensen had recently passed away, and the Department was undergoing some major changes and adjustments. I showed up as a hirsute hippy-esque sort from Southern California, and neither the Department nor I was quite sure how to deal with each other. One benefit the Department gained from these social changes of the 1960's and 70's was the increased admission of female graduate students (e.g., Annabel Chang and Carol Windels).

I started out in forest pathology with Dr. French and finished an M.S. in 1968. Then, for reasons that are unimportant now, I transferred over to the pea project with Dr. Tommy King for the Ph.D. Tommy had also just begun a pathology project on the newly cultivated crop of wild rice, and I helped out on this program, as well. When Tommy left for a sabbatical to Thailand in 1971, I finished my thesis under “Doc” Eide. In the opinion of most, “Doc” Eide was outstanding in many ways, one of which was the class he taught on “Principles of Plant Pathology.” I remember a photo that hung on a Department wall with “Doc” standing in a field, and it bore the whimsical caption “A man out standing in his field.” I hope this photo still has a place on a Department wall, somewhere. Dr. Eide is someone we kept in contact with regularly until his final days.

Shortly before completing the Ph.D. in spring 1972, I married Marcia (nee) Rosenau, a secretary in the Department. This was well before the days of computer word processing, so it was very handy to have a skilled typist who could handle carbon copies - and the price was right! Full time plant pathology jobs were scarce in 1972 (at least for me), so I spent the summer on a quasi-post doc studying bean root rot for Green Giant in Le Sueur, MN with Ted Reiling, another Minnesota pea project graduate. Thanks largely to the southern corn leaf blight epidemics of the early 1970's I found a job in 1973 with Northrup King Seed Company in Minneapolis. In 1980 I was gratefully transferred from Minnesota to their northern California research station. In 1986 I joined the Japan-based vegetable and flower seed company, Sakata Seed, at their research station in Salinas, CA, and have been there since, managing the plant pathology, seed health and biotechnology programs and dabbling at research on seed health and seed quality in vegetables and flowers.

Over a career in the seed industry that has now spanned 32 years I have been exposed to a broad range of experiences in applied plant pathology. These include working with plant breeders to develop disease resistant varieties, dealing with seed health issues in the lab and field, establishing quality assurance and testing programs for seedborne pathogens, developing strategies for producing healthy seed, and diagnosing a wide range of diseases and disorders. I have been able to work on agronomic crops, the small and large seeded vegetables, and even flowers reproduced both by seed and vegetative propagation. For a time I even dabbled in turf grass pathology and the taxonomy of *Drechslera* spp. and related fungi. During my career I have found that the basic principles of pathology learned as a graduate student at Minnesota are applicable in a variety of ways to solve practical problems. These basic principles form the foundation of my company's current disease management programs, and are also widely used within the vegetable seed industry. I dare say their application has resulted in significant improvements in seed and crop quality and performance over the years. Today, there is still a great need in the seed industry for broadly trained, applied plant pathologists in the Minnesota tradition.

Recollections of Minnesota

Following are some recollections from my time in the Department (some of the printable ones, anyway):

Dick Zeyen and I were office mates the last years of our graduate careers, and I still vividly recall the incessant clacking of typewriter keys and the pall of cigarette smoke generated by us. This has undoubtedly now been replaced in Dick's office by the incessant tippy-tapping of computer keys, minus the smoke. I still chuckle about the time John Menge was transplanting both live and dead black spruce seedlings into pots, and I asked what kind of experiment he was running. He said that although he only intended to transplant the live ones, because he was color blind he couldn't tell the difference between live (green) and dead (brown) plants as long as they “felt” alive. During several summers, Frank Pflieger and I avidly performed organoleptic evaluations of watermelon in the Northrup King vegetable variety trials looking for the potentially devastating “red heart” disease. Dr. Kommedahl was the Department's resident editorial guru, and the one to consult on questions of writing style, format, spelling, etc. It is good to see that Thor is still active in editing the *Focus* segment of *Plant Disease*. “Doc” Eide was also an excellent editor, but was somewhat of an iconoclast when it came to using punctuation, suggesting that a good way to handle editors with a punctuation obsession was to simply put all the commas, periods, quotation marks, etc. at the end of a sentence or paragraph and let the reader decide where they should go. Sounded reasonable to me!

The Department was renowned for its formal Tuesday afternoon seminar, during which normally poised graduate students could be reduced to the status of a stammering simpleton, or on rare occasion, literally to tears. There was little mercy or quarter given by staff during these events, and once the first drop of blood was let, the feeding frenzy only seemed to intensify. After a particularly

mortifying seminar experience, waves of terror would ripple through the graduate students whose seminars were yet to come. In looking back, the formal Minnesota Plant Pathology seminar was a great tool in preparing students for the many public and private presentations they would have to make during their professional careers. The thought was that it couldn't really get any worse than this!

In the late 1960's and early 1970's the "hot" pathology topics dealt with soil fungistasis, the physiology of parasitism, and horizontal/vertical resistance, while biotechnology was only a glimmer in the eyes of a few visionaries. I recall a series of seminars on horizontal and vertical resistance by Dr. van der Planck and the stir it caused in the Plant Pathology and Agronomy Departments because it challenged prevailing ideas about disease resistance and the use of resistance genes.

I was fortunate enough to have known Dr. Stakman while he was still active in the Department. Seeing "Stak" in action with his prodigious mental abilities left no doubt why he was such a formidable force in Plant Pathology. At the very end of his life, when Dr. Stakman's physical and mental abilities were waning, I visited him in the hospital, where I still found him to be engaging and capable of sage advice. I recall that "Stak" believed in reincarnation, and felt certain he would return in another life to continue on with his contributions to society.

Clyde Christensen (CMC) was a favorite of mine. CMC could be outwardly gruff and stoic, and when I went to visit him I was sometimes greeted by the question, "What's on your so-called mind?" Yet, CMC always took the time to answer a question, discuss his research, or identify a mushroom (I once showed him a photo of a mushroom that I had found and identified, and he simply said, "Well, no one can say you are wrong" - typical CMC).

Some Final Thoughts

Omnia mutantur, nos et mutamur in illis – All things change, and we change with them. "Doc" Eide once told me that those who choose plant pathology as a career should feel content that they have made a very useful contribution to society with their career choice. As I near the end of my professional life, I would agree with his assessment.

For the record, Marcia and I live in Hollister, CA (in earthquake country, just southeast of San Jose), where we have been for the past 18 years. Our two children (one of each gender) are now grown, and our daughter delivered our first grandchild this past March. We are now becoming more engaged in the process of thinking about when and where to retire.

Alumni Speak and Old Timer News

Matthew Culler (M.S., 2004)

Since defending my M.S. degree in February 2004 I have been working for Syngenta Seeds in Stanton, Minnesota, which is outside of Northfield. My primary responsibilities are data analysis of molecular marker projects on field corn. This includes setting up experiments for the marker lab and recommending plant selections for the breeding staff in Hawaii.

On the personal front Angela Hendrickson and I are getting married on October 29th in St. Paul. We will remain living in the St. Paul area at least until Angela finishes her Ph.D. and potentially beyond that point.

Ho-Shii Chang (Ph.D., 1972)

I retired from the Institute of Botany, Academia Sinica, Taiwan, R.O.C. on February 1, 2003 after 31 years working on plant pathogenic fungi and aquatic fungi. I really miss the Campus and its surroundings and hopefully someday I can come back and visit. Dr. MacDonald and Dr. Zeyen are the only persons remaining from my time as a graduate student - 1967 to 1972. It is sad to know Dr. French and Dr. Eide passed away. A couple of years ago Dr. Wilcoxson sent me a letter and informed me that he moved to Missouri to be near his daughter. He is and remains very kind to me and helped me finish my Ph.D. degree. I shall always remember his considerateness. I really enjoyed life during the years on Campus.

bododo@gate.sinica.edu.tw

Kasia (Duellman) Kinzer (M.S., 1996)

Greetings to my Alma Mater and fellow alumni, from Kasia Kinzer (nee Duellman, M.S., 1996)! The past 16 months that I have worked as Plant Diagnostician at North Dakota State University, have been a wonderfully crazy experience for me. In addition to coordinating responsibilities of the plant diagnostic lab, I also have teaching responsibilities that include three sections of the Introductory Plant Pathology lab. Teaching these labs bring back fond memories of teaching the lab portion for a similar course offered by the University of Minnesota Plant Pathology Department (the lecture was taught by my advisor, the late Dr. Richard Meronuck). My husband, Dwight, and our two kids, Elyce (4-1/2-years old) and Coleman (almost 3-years-old), have settled in north Fargo, within a couple miles of campus. Fargo is a metropolis compared to where we lived in Idaho for six years. It's a nice change, and I feel proud to be part of a vibrant and thriving department at NDSU.

Soon after I came here, to my surprise, I met a fellow UMN Plant Pathology alumnus, Dr. James (Jim) Venette. He was a faculty member in the NDSU Department of Plant Pathology and interim chair for the Department from 1997 to 1999. In 1999, he was appointed Associate Dean of Academic Programs at NDSU, and he serves in that capacity currently. He earned his Ph.D. from the UMN Plant Pathology Department in 1975, under the direction of Dr. Kennedy.

On another note, Fargo looks forward to hosting the 2006 APS North Central Division Annual Meeting next summer. The dates are June 13-15, 2006, and the contact person is Dr. Carl Bradley, (701) 231-7056.

Kent Evans and Julie Jenkins (M.S., 2000)

Kent and Julie both took positions in the Biology Department at Utah State University in Logan, UT. Kent is working in a tenure track position as the Extension Plant Pathology Specialist covering all diseases of field crops, orchard crops, and horticultural plants for both commercial and homeowner interests. Kent's research includes *Fusarium* head blight on wheat seedlings, fire blight on apples and pears, and an IR-4 experiment dealing with chemical control of greenhouse diseases of native ornamental plants.

Julie has taken a position in the Plant Pest Diagnostic Laboratory titled as Diagnostician and provides diagnoses of plant pathogens on their associated hosts. Julie works with homeowners and commercial producers and collaborates regularly with county extension agents dealing with their clientele. Julie is also involved with management of the PPDL and is active in updating their webpage and writing and updating fact-sheets.

Kent and Julie's daughter Hannah (2 years, 9 months old) has taken a position at the local daycare center in Logan and is currently working on her lifelong educational matters in consultation with her many colleagues there.

Kent and Julie report that Utah is a good place to live and that their new home, with an orchard having apples, pears, apricots, plums, cherries, grapes, black berries, raspberries, and currants, keeps them very busy along with their work and child. Minnesota visitors are welcome to stop in and share a cup of coffee anytime!

Silvia Peñuela (Ph.D., 2000) and Laszlo Gyenis (M.S., 1995; Ph.D., 2000)

I will start a post-doc with the University of Western Ontario on October 1st. My new advisor Dr. Dale Laird will fund my position with his Canadian Institutes of Health Research Operating Grants. It's a new field for me since I will be moving from DNA and RNA to protein expression and proteomics. The lab works on gap junction biology in the Department of Anatomy and Cell Biology here in London, Ontario. This city is the hot spot for medical research in Canada and this opportunity will be a great learning experience. My duties include research, teaching and mentoring of graduate students in our group. More information can be found at <http://www.uwo.ca/physpharm/gapjunction/index.htm>

Laszlo is still working at the Agriculture and Agri-Food Research Centre in London, Ontario on his Biopharmaceutical project. He has made great progress and his fellowship was just recently extended for the third year. We are happily settled here in London and the boys are already in first grade and pre-school, keeping up with their languages and learning French in school. We miss you all very much. Please send our best regards to everyone.

Silvia Pereyra (M.S., 2000; Ph.D., 2005)

After spending six weeks in Minnesota completing the writing of her thesis Silvia Pereyra defended her Ph.D. on August 1st. She then returned to Uruguay and her family and friends. Silvia has been busy catching up her work as a barley pathologist with INIA (Uruguay's national institute for agricultural research)

at La Estanzuela and has spent most of her time in the field. She has included a picture of one of her many field trips with farmers and crop advisors.



Andy Ryan (M.S., 1994)

Andy has been working as a research fellow in the School of Public Health at the University of Minnesota since 2000. He has worked on several different studies on a wide range of public health topics, including analyzing allergen exposure in inner-city homes, evaluating risk-factors for injuries in agricultural operations in the Midwest, and analyzing patterns of violence against teachers. His role includes managing the databases for these studies, and analyzing the massive data streams that are generated. Andy also assists many of their graduate students with their analyses, and he is involved in teaching a SAS/data analysis class. Though he enjoys the work, he misses his days in the Department, especially those days spent out-of-doors during potato planting and harvest (except for the *Erwinia*-infested tubers!!). He and his wife, Nadja, are proud parents of a 2-year-old son, Aidan.

Bacilio Salas

Bacilio joined the USDA APHIS PPQ CPHST PDDM Laboratory in Edinburg, TX as a Plant Pathologist in January 2005, after spending four years as a Research Associate in Ruth Dill-Macky's small grains pathology laboratory. Since his arrival Bacilio has assisted with the ICS-Indian River Citrus Canker (*Xanthomonas axonopodis* pv. *citri*) Survey in Florida and more recently prepared data sheets for several pest and diseases of citrus to be included in the Citrus Commodity Based Survey Manual prepared by APHIS Scientists.

Kurt Stromberg (M.S., 1998)

After completing his M.S. in Plant Pathology, Kurt worked for the USDA-ARS in New Orleans for two years. His work there focused on developing transgenic cotton lines with enhanced resistance to *Aspergillus flavus*. While in New Orleans, Kurt continued to develop an interest in statistics first sparked by Dr. Kinkel. In 2000, Kurt returned to Minnesota to pursue an M.S. degree in Biostatistics in the School of Public Health at the University of Minnesota. Since 2002, Kurt has worked as a Biostatistician for the Pharmaceutical Division in the 3M Company. Kurt and his wife Jennifer continue to live near the St. Paul campus in the Como Park neighborhood with their two cats and two birds.

IN MEMORIUM

Dr. John S. Niederhauser- Extraordinary Plant Pathologist

By Richard J. Zeyen

Dr. John Niederhauser, potato pathologist and World Food Prize Laureate 1990, died in his sleep on August 12, 2005 at his home in Tucson, Arizona. John grew up in central Washington, and was a top student at Cornell, earning his Ph.D. in Plant Pathology in 1943. Niederhauser along with Minnesota alumni George Hararr (Ph.D., 1935) Norman Borlaug (Ph.D., 1942 – Noble Peace Prize, 1970) were Rockefeller-funded scientists who created the existing worldwide network of international plant breeding and development centers. While Hararr and Borlaug concentrated on wheat and maize in the Mexican effort (resulting in CIMMYT), Niederhauser concentrated on potato. Niederhauser's work in Mexico (one of the centers of origin of potato) spread worldwide and he was credited as the driving force in the establishment of the International Potato Center in Lima, Peru. Not only was potato production increased in Mexico and Peru, but also programs in Turkey, Bangladesh, India, Colombia, and Pakistan boosted production four to eight times.

John Niederhauser, like his friend and colleague Norman Borlaug, has ordered that all his correspondence and professional papers go to the University of Minnesota Library.

John was a multidimensional, extraordinary man. He was a friend of E. C. Stakman and Norman Borlaug, with whom he shared a life-long love of baseball. In fact, John Niederhauser was the founder and president of Little League baseball in Mexico and the Latin American Commissioner for Little League baseball from 1957 to 1969.

This reporter last had lunch with John at the 2004 APS meeting in Anaheim, California. John was up to his usual hilarious and insightful quips and quirks, discussing politics, world hunger, his beloved Mexico, and, of course, potatoes. There was never a humorous story or brief one-liner John did not appreciate. His story-telling skills were well honed and exceptional.

Those of us who were privileged to meet him shall all miss him. He was one of the world's truly good human beings, an exceptional plant pathologist, and humanitarian.

Professor Emeritus William E. Fenster (International Programs)

William E. Fenster, former director of the Office of International Agricultural Programs at the University of Minnesota, died on August 21 in Dothan, Alabama, at the age of 70. Fenster, a soil scientist served in many international programs over the course of his career. He represented the University of Minnesota on projects in Nigeria, Mauritania, Colombia, Morocco and Uganda. Following the collapse of the Soviet Union, he developed agricultural programs in the Russian Federation.

Borlaug Fellows

Preparing the next generation of researchers expanded this year as the University of Minnesota hosted its first Norman Borlaug International Agricultural Science and Technology Fellows. These fellowships are funded through the USDA. The first Fellows arrived on campus through a partnership with the Tropical Agricultural Research and Higher Education Center in Costa Rica. Two Borlaug Fellows from Ethiopia will work with Dr. Yue Jin in the fall at the USDA-Agricultural Research Service's Cereal Disease Laboratory to learn techniques in working with wheat stem rust that recently emerged as a global threat to wheat production due to the occurrence a new virulent race.

ENDOWMENTS

Contributions to Endowment Funds Support Research and Graduate Education

Contributions to the University of Minnesota Plant Pathology Endowment are greatly appreciated! The Department of Plant Pathology is extremely fortunate to have the ongoing support of alumni and friends through our endowments. Endowment funds continue to be especially important to supporting the Plant Pathology Library. In addition to the Library, endowment funds are focused on supporting our graduate students. Endowment funds provide support for two full-time graduate student assistantships, supply funds for student travel to scientific meetings, and have been invaluable in launching and sustaining our graduate student international internship program. As always, we have provided an envelope for you to use in making contributions to our endowment funds in this copy of the *Aurora Sporealis*. In addition, we would be happy to work with you in exploring other options for supporting our endowments (e.g. through your will or via a gift annuity or trust fund). Please contact Cynthia Livingston, Director of Development, 277 Coffey Hall, 1420 Eckles Ave., St. Paul, MN 55108 (clivings@umn.edu) for more information.

By the Numbers

48,484: Spring 2005 enrollment at the University of Minnesota-Twin Cities

13,459: Spring 2005 graduate student enrollment at the University of Minnesota-Twin Cities
(**438** in COAFES).

218: Faculty in the College of Agricultural, Food and Environmental Sciences (COAFES)

25,000: Square feet of green house space in the new and renovated Plant Growth facilities with
41,000 square feet of classroom, laboratory and work space.

11: Departments in COAFES

6: Research and Outreach Centers in COAFES

18: Faculty in the Department of Plant Pathology

7: Adjunct faculty in the Department of Plant Pathology

839: Graduate degrees conferred by the Department since founding in 1907

10: Graduate degrees conferred in 2005 by the Department

19: Percent of COAFES budget from grants and contracts

5, 548,529: Dollars of grant funding obtained by faculty in Plant Pathology for 2005

1: Rank of Plant Pathology in terms of obtaining grant funding for departments in COAFES in 2005

FACULTY NEWS

FACULTY ACTIVITIES

We invited all faculty members to share their previous year's experiences so that readers may have a sense of what the faculty do in addition to routine teaching and research. We thank those who agreed and submitted information about their activities.

Robert A. Blanchette

It has been an exciting year for research in the lab and field with many new discoveries and developments. Regrettably a very fine student, **James Jacobs**, was called to active duty in Iraq by the National Guard. James has left his family and has had to put his graduate studies on hold while in Iraq for the next 12 months or more. We all are very grateful for his dedicated service to our country and we hope he stays well. James is on the look out for unusual tree diseases while there and we hope he finds some but trees are few and far between. We look forward to his speedy return to the University where he will have plenty of diseases to find and work on.

Some of the new developments include the finding of a previously unreported species of *Phytophthora* in the United States, *P. hedraiaandra*, affecting *Rhododendron* species. Graduate student **Brian Schwingle** has been doing surveys, characterizing the fungi found and carried out Koch's postulates. Defense mechanisms of selected eastern white pine resistant to white pine blister rust have been elucidated in several publications by **Jason Smith** who completed his Ph.D. last spring. This includes a proteomic study of defense responses as well as an environmental SEM study of epicuticular waxes on needles. Jason continues to work on this project in my lab and on the molecular characterization of willow rust in Arctic and temperate regions of the world. Details on these projects and more can be found at my web site:

<http://forestpathology.coafes.umn.edu/>. If you have not visited this site please take a look. It is filled with useful information on tree diseases and provides all the current details of our work as well as photos and pdf files of all published papers.

Benjamin Held, Joel Jurgens and **Brett Arenz** are working on three different National Science Foundation grants we currently have dealing with Antarctic microbes and preservation of the historic expedition huts, ancient wood from terrestrial and aquatic environments in Turkey, and how microorganisms respond to carbon-based manufactured nanoparticles (fullerenes). An NSF sponsored trip to the Antarctic Peninsula on the U. S. Antarctic Programs Laurence M. Gould Research Vessel in April provided Ben Held and me with the opportunity to collect from a large number of very remote Antarctic sites to compare the fungal flora of this region to that of the other side of the continent where the historic huts are located. Molecular analyses of fungi from here as well as isolates from the Ross Sea region show many new species and even new groups of unreported fungi present. By the time you read this issue of the *Aurora* new papers will have been published on this topic and can be viewed at my web site.



*Bob Blanchette holds field workshop on producing agarwood from *Aquilaria* trees in Papua New Guinea.*

Our agarwood project (agarwood is the name of a valuable resin formed in *Aquilaria* trees) continues with demonstration trials in many countries. In May, the United Nations FAO sponsored Joel Jurgens and me to train and establish field trials in Papua New Guinea. This project has great potential to help some of the world's poorest people generate a new source of income by providing a new non-timber forest product that will add greatly to their lives. In addition to PNG, large-scale field trials are now underway in Thailand, Vietnam, and Bhutan. For details on this work in PNG and other countries see the Agarwood/PNG link at my web site.

For those interested in civil war history we have a cooperative project with the Mariners Museum in Newport News, Virginia to help with conservation efforts of the USS Monitor. The Monitor, an iron clad ship that battled the CSS Virginia (formerly the USS Merrimack) during the civil war, sank during a storm in 1862. The turret (filled with wood bracing), other sections of the ship and many wooden artifacts from inside the ship were recently recovered. Our work involves characterizing the current condition of the woods, examines the decay present and evaluates super critical drying and other conservation treatments so the most appropriate method can be found to successfully preserve the deteriorated wood. Portions of the ship and numerous artifacts will be displayed in a new section of the Mariners Museum beginning in 2007. A new project has also begun with the Western Australian Maritime Museum to evaluate deterioration in wood from the James Mathews shipwreck that sunk in 1841. Research with the National Parks Service is underway with studies at Aztec Ruins National Monument in New Mexico and Tonto National Monument in Arizona where wood from the prehistoric great houses and cliff dwellings is being studied and conservation efforts (including reburial of several prehistoric sites) are being monitored.



James J. Jacobs, Graduate Student in Plant Pathology James has left his graduate studies to serve in Iraq as a member of the Wisconsin National Guard. We are proud of his service and his efforts to bring freedom, peace and hope to the people of Iraq and the world. We look forward to his return so he can complete his graduate work and research.

A special fund has been established at the University for public support of our national and international research efforts and if you are interested in contributing to keep this important work going there is an easy on-line method for making donations at: <http://forestpathology.coafes.umn.edu/contributions.htm>

Jim Bradeen

The past year has been an exciting, productive time for the Potato Pathology and Genomics group, with departures, new arrivals, and research advances in the lab and field.

We said goodbye to graduate student **Maria Sanchez** this spring after she earned her M.S. degree, the first degree granted under the Department's "Molecular Option." Maria is now living near St. Louis, MO and works for Monsanto. We don't really know what she does—she can only say it is "top secret". We assume it has something to do with plant pathology though! In June we also said goodbye to **Riccardo Aversano**, a Ph.D. student from the University of Naples, Italy who came to our lab for 15 months to complete his graduate research. Riccardo's research goals included characterizing molecular diversity near disease resistance genes in natural populations of wild potato. Riccardo's stay was very productive for all of us and helped to significantly strengthen collaborations with colleagues Domenico Carputo and Luigi Frusciante at the University of Naples. We look forward to the possibility of Riccardo returning for an extended visit following the defense of his dissertation this December.

Continuing M.S. student **Ed Quirin** was awarded the M. F. Kernkamp Fellowship this year. Ed has been an active member of the Department, serving on the organizing committee for the Graduate Student symposium, serving on the seminar committee, and serving as a teaching assistant in PIPa 1002 ("Plant Diseases and Your Garden") and PIPa 1005 ("Plants Get Sick Too"), courses taught by Dave MacDonald. Ed's research projects have focused on the development of resistance gene candidate libraries for disease resistant potato species and discovery and characterization of a family of highly repetitive DNA sequences in certain Solanaceous species. Ed will complete his degree in early 2006. **Ryan Syverson**, also a continuing M.S. student, is generating molecular maps for a wild, disease resistant potato species. The catch? Ryan is also testing new approaches to molecular mapping and marker development. (Like Maria's current research, Ryan's project is "top secret"—we'd really love to tell you more, but we can't! At least not yet....) **Ben Millett**, a Ph.D. student, has developed an elegant assay to examine expression of a late blight resistance gene in potato tubers and leaves. Using this assay, Ben will be able to correlate gene transcription with disease resistance and study resistance gene regulation throughout plant development. Ben was awarded a training grant from the *Phytophthora* Genomics Consortium and will spend several weeks this Fall in the laboratory of Sophien Kamoun at The Ohio State University. While in Sophien's lab, Ben will test for *in vivo* interaction between putative *P. infestans* (late blight) Avr factors and cloned late blight resistance genes.

This year we also welcomed two new graduate student members to our group. **Steve McKay** and **Adriana Telias** are both Ph.D. students in the Applied Plant Sciences program at the University of Minnesota. Steve is co-advised by Jim Luby (Horticultural Sciences) and Jim Bradeen and Adriana is co-advised by Emily Hoover (Horticultural Sciences) and Jim Bradeen. Their research subject? Nope, not potatoes. Both Steve and Adriana work on the "Honeycrisp" apple. Steve is generating a molecular map of "Honeycrisp," including genes responsible for its unique crispness. Generating crispness data on hundreds of segregating progeny entails large weekly taste panels, mechanical measurements of force required to break a column of apple tissue, blotting apples slices to estimate juice content, and even digital analysis of the sound an apple makes when it is chewed! Adriana is curious why some "Honeycrisp" apples have distinct yellow and red stripes while others have a blushed appearance. Adriana has asked a simple question that will certainly be a challenge to answer. We're betting the phenomenon is related to the epigenetic control of transcription factors conditioning anthocyanin production. So, while Steve and Adriana aren't working on the world's fourth most important human food crop (that would be the potato), the projects are related to other activities of our group through common methodologies. Besides, the potato is also known as "pomme de terre" (apple of the earth) while the apple might be called "pomme de tree." (No one in the lab thought that was funny either....)

And finally, I am happy to report Junior Scientist **Dimitre Mollov** has survived his first full field season. "Survived" is a bit of an understatement! 2005 was a great year for field research for the Potato Pathology and Genomics group, in no small part due to Dimitre's dedication, organization, and hard work. As in the past, we continued collaboration with the UM Potato Breeding program to screen breeding lines for late blight and common scab resistance. We also, once again, served as a testing site for the National Late Blight, National Scab, and Quad State (ND, MN, WI, MI) trials. This year we also screened research materials for University of Wisconsin researchers Dennis Halterman and Bryan Bowen and expanded our efforts to screen heirloom potato cultivars for scab and late blight resistance. We even initiated an herbicide tolerance study for disease resistant wild potato species. But Dimitre's contributions aren't limited to the field. Dimitre has optimized greenhouse conditions to allow for year round late blight screening. And in the lab, he is currently cloning and sequencing a recombinant late blight resistance allele. In his "free time," Dimitre enrolled in several graduate courses during the past year including courses in molecular plant pathology, bioinformatics, and business management. Dimitre has also done a great job redesigning the Potato Pathology and Genomics website. If you want to know more about our program or are just curious about what heirloom potato you can grow in your garden scab-free, check us out:

<http://ppg.coafes.umn.edu>

Ruth Dill-Macky

The small grains pathology lab has seen a year of change with the departure of several of the "lab fixtures." **Kent Evans** who had been working in the small grains pathology lab since 1995 departed in September 2004 for a faculty position in the Department of Biology at Utah State University. In December 2004 **Bacilio Salas**, who had been in the lab the last four years departed for Edinburg, Texas for a position with USDA-APHIS. Their departure from Minnesota was felt with mixed emotions. It was wonderful to see that them moving on with their careers, taking permanent positions and starting new adventures. However, it was sad to see them go and the lab sure seems smaller without them. Their expertise with *Fusarium* research will be sadly missed.

In June **Silvia Pereyra** returned to Minnesota and spent six busy weeks finishing her thesis. Silvia stayed with me in my little house in Saint Anthony Park. Silvia defended her thesis in early August and returned to Uruguay. **Carlos Perez** completed his M.S.

degree in September under the joint supervision of myself and Linda Kinkel. Carlos will be staying on to undertake his Ph.D. degree with Dr. Bob Blanchette.

Josef Matuschka spent eight weeks in July and August doing a summer internship with our pathology group. Josef arrived just in time to inoculate field plots with *Fusarium* and was then able to observe the development of Fusarium head blight in wheat and barley and assist in disease rating and sampling of the plots. Josef also learned how to process tissue samples for mycotoxin analysis, spending his final week helping with the deoxynivalenol analysis in **Yanhong Dong's** lab. Josef is the seventh student from the Agricultural University of Vienna, Austria, to have completed a summer internship in small grains pathology.

Our smaller lab consisting of myself, **Amar Elakkad**, **Karen Wennberg**, and **Beheshteh Zargaran** had a busy year keeping up with a sizable field program despite the loss of personnel. Karen and Amar did an amazing job handling the field program in 2005 and it was a tough year with lots of rain and a serious FHB epidemic that impacted the wheat and barley growers in the Red River Valley. Thanks for all your hard work!



Ruth Dill-Macky and her two standard poodles, Bronte (7 years old) and Koru (3 months).

On a personal note, my own household expanded with the arrival of "**Koru**" a 10-week old standard poodle puppy in late July. Koru has settling in well and he is getting along wonderfully with my older...and wiser... standard poodle **Bronte**. Koru has been a delightful puppy and has learnt the rules of the household quickly. although I dare say the kitchen cabinets will never look the same. Koru has visited the department a few times already (puppy socialization) and has already figured out that **Ann Arendt** has the treats!



Small Grains Pathology lab and Yanhong Dong. Back row (from left to right) Josef Matuschka (summer intern), Karen Wennberg, Amar Elakkad. Front row Yanhong Dong, Ruth Dill-Macky, Beheshteh Zargaran. The photo was taken at our summer harvest BBQ and farewell for Josef Matuschka.

Yue Jin

In May, Dr. Jin attended the NCERA-184 meeting, held at Cornell University and presented a talk on the development of stem rust in East Africa. With assistance from Dr. Gary Bergstrum, Yue Jin spent two days in upstate New York to look for barberries and found a number of large bushes of common barberry in the rural areas of the Finger Lakes region as well as at the Campus of Cornell University in Ithaca. Aerial infections were found on these bushes. In July, Yue Jin visited the USDA Small Grains Germplasm Research Facility located in Aberdeen, ID. He gave a seminar on U. S. wheat resistant to the new African stem rust race, visited field operations of the National Small Grain Collection, and attended the field increases of Cereal Disease Lab materials. He saw significant amounts of stripe rust in wheat and barley, which was a rarity in Aberdeen. He also held discussions with several scientists in Aberdeen on the characterization of rust resistance in the wheat collection, and on the future screening of U. S. wheat germplasm in Kenya and Ethiopia. Yue Jin will be traveling to Kenya in October to evaluate stem rust of U. S. wheat germplasm planted in Kenya and to Ethiopia in the same trip to identify potential nursery locations for future screening.

Jennifer Juzwik

In late October and early November 2004, I spent a memorable 16 days in Poland as an invited guest of the PROFOREST Program of the Forest Research Institute in Warsaw and Sekocin. I presented a presentation at a conference for Polish forest managers, a seminar for the forest pathology department in the Agricultural University in Poznan, and a seminar for the staff at the Forest Research Institute in the Warsaw area. My excellent host, Tomasz Oszako, and I spent much time looking at alder affected by the "alder *Phytophthora*" along streams and rivers in eastern and central Poland. We also spent many hours looking at bleeding spots on oaks in forests from the Poland-Belarus border in the east to south of Poznan in the western part of the country. The other highlight of the past 12 months has been the opportunity to "lay aside" my administrative responsibilities as Project Leader for the USDA Forest Service Forest Diseases Unit for 6 months and focus on writing and research. It has been wonderful to work with **Maya Hayslett** (M.S. student) studying insect vectors of oak wilt in central Texas and in central Missouri, and with **Ryan Blaedow** (Ph.D. student) on more basic studies of the interaction of propiconazole and *Ceratocystis fagacearum* in the root collar and roots of red oak trees. I also enjoyed the opportunity to see **Jordan Eggers'** interest and expertise in forest pathology grow as he led our effort in isolating for *Phytophthora* species from soils in oak forests of Michigan, Minnesota, Missouri, and Wisconsin.

Jim Kolmer

2005 has been another busy and fun year. In May I went on a 10-day canoe trip to Quetico Provincial Park in northwest Ontario (north of Boundary Waters National Park). Our first day into the lake, we had snow and sleet and whitecaps on the water. After that the weather improved somewhat and our group was able to paddle and portage about 90 miles during the trip. Quetico is a nice place to canoe as the major portages are fairly wide, and cleared of brush. However by going early in the year (to avoid the bugs and crowds) the portages can also be filled with water in low spots, which can make for some very acrobatic canoe carries. There are also lots of very nice established campsites in the park.

I also took an excellent course in early retirement in August that was taught by **Dr. Jim Groth** of Colville, WA. I visited Jim and Joann in their new home, which is about 80 miles north of Spokane. They live about eight miles outside of Coville, on the side of a large hill, surrounded by Douglas Fir and some Ponderosa Pine. The area is fairly mountainous with small towns and agricultural fields in the river valleys. Jim and Joann are enjoying retirement immensely, keeping busy by enjoying the natural beauty, and flora and fauna of the area.

My research project continues to work on describing genetic variation in the wheat leaf rust fungus, and working on various aspects of rust resistance in wheat. **Maria Ordonez**, a Ph.D. student in the lab, has been characterizing variation in collections of leaf rust that are highly virulent to durum wheat. Maria has found that the durum type leaf rust isolates are generally avirulent to most of the resistance genes found in common wheats and that the durum type isolates are also very distinct for molecular variation compared to the isolates from common wheat. **Carmen Vanegas**, an M.S. student, has been working on determining the location of stem rust resistance genes and has found two chromosomal regions that confer the stem rust resistance in the older Minnesota wheat cultivar Thatcher. She has also been able to show that the expression of the stem rust resistance is dependent on the presence of a genetically independent gene for leaf rust resistance.

At the USDA-ARS Cereal Disease Laboratory, we continue to monitor populations of leaf rust in the U. S. for new races that may be virulent to wheat cultivars. This work has been conducted by **Dave Long** for many years. Dave also tests wheat germplasm for leaf rust resistance. We have also been developing microsatellite (SSR) markers for characterizing different populations of wheat leaf rust. These markers will be extremely useful for population genetic studies of wheat leaf rust. I also have projects with Dr. Jim Anderson in the Agronomy and Plant Genetics Department, to develop wheat cultivars with improved rust resistance.

In March I visited the CIMMYT wheat project rust plots at Obregon in Sonora State, Mexico. I had a very nice visit with Dr. Ravi Singh and Dr. Julio Huerta, of CIMMYT and the Mexican National Program, and got a very nice tour of the Yaqui Valley from **Dr. Pedro Figueroa**, an alumnus of the Plant Pathology Department. As I write this in September, I am getting ready for a trip to Australia to attend a rust conference in honor of Bob McIntosh. It should be fun.

Jim Kurle

2005 has been an exciting and productive year for soybean disease research in Minnesota. The personal achievements of members of the soybean pathology group were especially pleasing. In May, **Haiyan Jia** successfully defended her thesis research on resistance and partial resistance found in very early soybean cultivars. In July, **Sharon Lewandowski**, a scientist with the group completed the defense of her thesis on *Fusarium* infection of barley. Haiyan will continue her graduate career in research on the interactions of *Fusarium* head blight and small grains. **Paul Meyer**, research assistant in the soybean pathology lab, continued his investigations into the role of environmental factors in the development of soybean root rots. Haiyan, Sharon, and Paul's efforts were supported by grants for research on soilborne pathogens from the Minnesota Soybean Research and Promotion Council and the North Central Soybean Research Program.

The threat of Asian Soybean Rust dominated my activities during 2005. In November 2004 soybean rust was detected in the United States. Follow-up surveys found soybean rust in seven other Southeastern and Gulf Coast states. In November I attended a symposium on soybean rust hosted by Syngenta Corporation at their headquarters in Basle, Switzerland. This meeting, attended by soybean pathologists from throughout the United States, concluded only days before the first report of soybean rust was made in the United States. January and February were devoted to numerous activities in extension and outreach. I also had an opportunity to see the effects of soybean rust firsthand in February when I visited several areas in Brazil where soybean rust was present. This trip, hosted by BASF Corporation, provided an opportunity to meet with researchers from Brazil and throughout the United States. During March, April, and May I participated in meetings that initiated a national research, monitoring, and education effort involving personnel from all soybean-growing states. Throughout the summer this effort was maintained and coordinated by means of e-mail and conference calls. In Minnesota funds were obtained from the Minnesota Rapid Agricultural Response Fund to support a diagnostician and coordinator for a network of 36 sentinel plots located throughout the state. These funds also provided support for the establishment and analysis of spore collectors located at each plot. Rapid Response funds were also awarded to develop a soybean rust "Early Warning System" that combined information from sentinel plot observations, spore deposition results, and a weather based model into a disease forecaster for Minnesota farmers.

For me the year was an education and opportunity. In short order, I had to redirect my research efforts to soybean rust in activities that involved not only research but also outreach, extension, and education. Our efforts involved farmers, Extension service staff, volunteer sentinel plot observers, faculty from several University of Minnesota departments, personnel of the Minnesota Department of Agriculture, and members of the Minnesota Soybean Research and promotion council. It was also a lesson in communicating through the media. And - just how difficult it is to keep the elusive soybean rust "virus" from making it into print.

Deborah Samac

The lab continues to be very active in the areas of alfalfa pathology and *Medicago* genomics and to a lesser extent in alfalfa biotechnology. We celebrated **Claudia Castell's** completion of her Ph.D. degree in January on the diversity and mechanisms of pathogenesis of *Phoma medicaginis*, the causal agent of spring black stem and leaf spot of alfalfa. Claudia is now doing postdoctoral work with Brian Steffenson, juggling numerous projects simultaneously. We continue to pursue research on the other *Phoma* pathogen of alfalfa, *P. sclerotioides*, which causes brown root rot. Funded by the Minnesota Rapid Agricultural Response fund, we are working with Char Hollingsworth and colleagues in Agronomy and Plant Genetics to survey for the pathogen, screen for resistance, analyze diversity in the fungus, and identify other hosts. **Jan Flor** was instrumental in the spring survey and postdoctoral scientist **Dr. Jenny Larsen** has developed a real-time PCR assay for the fungus that will help in tracking the organism in soil and plant material. In the area of *Medicago* genomics **Dr. Dawn Foster-Hartnett** and graduate student (Plant Biological Sciences, PBS) **Divya Chandran** are using microarrays to investigate responses of *Medicago truncatula* plants to pathogens and aluminum stress. **Dr. Mesfin Tesfaye** will be the first on campus to use the newly developed *Medicago* gene chip to begin to determine gene expression differences between alfalfa and *M. truncatula*. **Mindy Dornbusch** supports many lab projects while producing transgenic alfalfa for studying the effect of gene silencing using interfering RNA. Although I have good intentions of doing lab work, Mindy is doing "my" projects as I get tied up with administrative duties. We continue to collaborate with Mike Sadowsky to develop plants that can remediate atrazine-contaminated soil and PBS graduate student **Lorien Radmer** is testing transgenic oat plants for aluminum and metal tolerance. We had great summer interns this year from Fort Valley State (**Betsy Ampofu**) and North Carolina State-Pembroke (**Kameron**

Richardson). **Alex Ellram** was in St. Paul for about 8 weeks this summer to continue his field and lab research on dollar spot in turf grass. I was able to travel to Australia this spring to attend a *Medicago* genomics meeting and extend my Aussie bird list by 30 some new birds. I am pleased to see the merger of the Plant Molecular Genetics Institute, for which I served as the director for the past two years, with the Center for Microbial and Plant Genomics into the Microbial and Plant Genomics Institute. It is staggering to reflect on the progress in plant molecular biology since I was a graduate student and makes me wonder if we can even imagine what we will discover over the next few decades. It is a fantastic time to be involved in plant pathology research and the discovery of new knowledge!

Carol E. Windels

In April, **Jean Rowntree** completed her M.S. degree and was hired at Seminis Vegetable Seeds in DeForest, Wisconsin. Her thesis was on survival of oospores of *Aphanomyces cochlioides* buried in soil after they were preconditioned at various levels of relative humidity. The sugar beet pathology program also had a very active year investigating control of major soilborne pathogens with the very capable assistance of **Jason Brantner** (Research Fellow) and **Mary Johnshoy** (Junior Scientist). Funding was received from the Minnesota Rapid Agricultural Response Fund and the Sugar Beet Research and Education Board to establish two, long-term research sites in the mid and southern Red River Valley (RRV) to examine the suppression and fertilization of *Aphanomyces*-infested sugar beet fields amended with industrial “waste” lime (a by-product of processing sugar from roots). Two grower-cooperators are providing land (4 acres of plots plus 2 acres of access roads) for each of the next 5 years. Albert Sims (Soil Scientist at the NW Research and Outreach Center) is a co-investigator. Cooperators include Carl Bradley (Extension Plant Pathologist, North Dakota State University, Fargo), John Weiland (Plant Pathologist, USDA-ARS Lab, Fargo) and the three sugarbeet cooperatives in MN and ND (American Crystal Sugar Company, Minn-Dak Farmers Cooperative, Southern Minnesota Beet Sugar Cooperative). In the last decade, there has been an increase in RRV acreage planted to soybean, edible bean and corn - all potential hosts of *R. solani* AG 2-2 IIIB. Typically, *R. solani* AG 2-2 IV is noted as the primary cause of Rhizoctonia root and crown rot of sugar beet, but we have found that AG 2-2 IIIB is a more aggressive pathogen than AG 2-2 IV on sugar beet. This summer we initiated a survey to identify the intraspecific groups (IIIB and IV) of *R. solani* causing root and crown rot of sugar beet in the RRV and southern Minnesota. Field trials also were established to study effects of various rotation crops (soybean, corn, and wheat) in *R. solani*-infected fields on survival of inoculum and severity of disease on a subsequent sugar beet crop. In addition, over 75 diseased sugar beet samples were brought to the lab for diagnosis and most required culturing.

Nevin Young

Professor Young and his colleagues continue to lead the genome sequencing of the model legume, *Medicago truncatula*. This plant, a close relative of alfalfa, is the focus of worldwide research in order to understand the molecular basis of symbiosis and the metabolism of important health-promoting compounds. Dr. Young’s lab is coordinating the sequencing effort along with collaborators at the University of Oklahoma, The Institute for Genome Research (TIGR) in Maryland, and colleagues throughout Europe, primarily France and the U.K. These international collaborations lead to trips to exciting conferences and workshops – like John Innes Centre in England and IGER in Wales in 2005, as well as scientists from interesting places, like **Dr. Carine Ameline-Torregrosa**, a post-doctoral fellow from Toulouse, France. As part of the sequencing project, the lab hosted Dr. Elizabeth Shoop, a visiting professor from Macalester College, and five undergraduate fellows during the summer. Dr. Shoop and the students focused on the emerging field of bioinformatics and its application to plant genome evolution. In addition to Dr. Torregrosa, the lab has also been host to several other post-doctorals, including **Dr. Joann Mudge**, **Dr. Min Wang**, who recently left to become an assistant professor at Northwestern University, and **Dr. Steven Cannon**, who will be leaving in spring 2006 to take a position as an ARS scientist/assistant professor at Iowa State University.

During the coming academic year, 2005-2006, Dr. Young will be on sabbatical leave, spending several months with his family in Toulouse and working at ENSAT (L’Ecole Nationale Supérieure Agronomique de Toulouse). While in Europe, he will be meeting with his many *Medicago* sequencing collaborators in order to plan the analysis and publication of this important genomics resource.

Richard Zeyen

Professor Zeyen continues his research and writing on the molecular bases of plant responses to fungal attack. He was an invited speaker at a special symposium on “Partial Resistance to Plant Diseases” at this summer’s American Phytopathological Society meeting in Austin, Texas. His presentation title was, “Fast, intermediate and slow acting barley powdery mildew *R* genes influence transcription patterns of basal defense response genes.” His recent research involves the fate of plant cells following programmed death due to a hypersensitive response. He is investigating whether dead cells can be processed by plants to continue to serve even after death. Preliminary evidence using X-ray microanalysis suggests that certain cells, in the act of undergoing programmed cell death, accumulate chemical elements and may act as non-living reservoirs for potassium, manganese and silicon. For the 11th year professor Zeyen taught his course “Physiology and Molecular Biology of Plant-Microbe Interactions.” In 2005 he finished his term as Chair of the Investment Advisory Committee for all scientific societies housed at the headquarters of the American Phytopathological Society. He is a member of the University of Minnesota Faculty Senate, serves on the university’s McKnight Land Grant Professorship Selection Committee, and represents the Saint Paul Campus on the Provost’s Conflict Review Committee, which along with University legal council reviews potential conflicts related to financing of research and connections between faculty researchers, staff and students with non-university entities.



Dean Malvick Joins Department as Row Crops Extension Pathologist

By Jim Kurle

In August the Department of Plant Pathology welcomed Dean Malvick as a new faculty member. Dean assumes a position with both research and extension responsibilities for diseases of row crops. Dean's broad range of experience make him an ideal person to assume the outreach responsibilities demanded of an individual in an extension position. Dean brings a wide range of experiences from both field and laboratory research in a variety of crops and their diseases.

A native of Minnesota, Dean received a B.S. in Biology from Bemidji State University, an M.S. in Botany and Plant Pathology from Oregon State University, and a Ph.D. in Plant Pathology from the University of Minnesota. As a research technician at Oklahoma State University and research fellow at Minnesota, Dean conducted research on molecular biology of phytopathogenic bacteria, ecology and population biology of fungi, and disease resistance in legumes and wild rice. Dean was a postdoctoral associate at the University of Minnesota with Dr. Jim Percich on resistance to the pea root rot pathogen *Aphanomyces euteiches*. He also held a position as research and teaching associate at the University of Wisconsin-Madison with Dr. Craig Grau where he taught and coordinated general plant pathology laboratories and conducted research on diseases of pea and soybean. Dean also has experience in private industry as a Research Pathologist with W-L Research with responsibilities for diagnosis of alfalfa diseases, developing and testing disease resistance traits, preparation and delivery of disease training materials, and field-day programs for alfalfa disease diagnosis and management. In 2001 Dean joined the faculty in a tenure-track at the University of Illinois at Urbana-Champaign where his appointment was split between extension and research focused on management of important diseases of soybeans, corn, wheat, and alfalfa. While at Illinois Dean participated in management of research priorities and funding decisions in the Plant Pathology and Entomology Managed Research Area for the Illinois Soybean Program Operating Board. His extension activities at Illinois involved the extensive personal contacts demanded of an extension specialist. They also included the adoption and use of various electronic technologies to transfer information including development of Web sites, and delivery of information via Latitude Bridge and teleconference systems. He was actively involved in research projects in the North Central Region and was a team leader for research on *Phialophora gregata*, the pathogen causing Brown Stem Rot of soybean. In all these positions he has been an innovator in the application of molecular technologies to applied disease management questions. Dean has also served in committee and leadership positions in the American Phytopathological society where he was chair of the North Central Division during 2005.

Dean is active in outdoor sports and enjoys biking, hiking, canoeing, and cross country skiing. He and his wife, Kimberly are enjoying their return to Minnesota. We welcome them back to Minnesota and look forward to their contributions to the life of the Department of Plant Pathology and the research, teaching, and outreach missions of the University of Minnesota.

Dr. H. Corby Kistler: *Fusarium* genetics and genomics

By Karen Broz

The genus *Fusarium* contains fungal plant pathogens famous not only for their wide host range and ability to produce mycotoxins, but also for the negative economic impact these diseases have worldwide. From basic biology to molecular genetics to genomics, Dr. H. Corby Kistler of the USDA ARS Cereal Disease Laboratory has greatly contributed to the understanding of this important genus.

Dr. Kistler's interest in plants began while growing up in Warren, Ohio. Besides working in steel mills, he also worked in nurseries doing landscaping, selling and planting flowers and trees. At the time he was oblivious to plant disease, but did recall a close encounter with a yellow jacket nest resulting in 40 – 50 stings and a trip to the hospital.

At Kent State University, Dr. Kistler was pre-med and majored in Biology. He focused on animal anatomy related courses and was a lab assistant for a cat anatomy course, dissecting cats to illustrate organs for the students. He intended to stay pre-med until a course required him to perform a vivisection on a turtle, which he felt was incredibly cruel, and that sharply diminished his interest in animal science. During his senior year he took just about every botany class that was offered, strengthening his interest in the plant sciences.



Dr. Corby Kistler and the one that got away.

After completing his BS, Dr. Kistler worked as a lab technician in a biochemistry laboratory at the Case Western Reserve University Medical School. Despite the ardent efforts of his boss to encourage him to apply to medical school, Dr. Kistler decided that it was not the right fit for him. At this time he began browsing graduate school catalogs and discovered plant pathology, which he viewed as a fusion between med school and botany.

Dr. Kistler attended Cornell University for his Ph.D. in plant pathology. Dr. Hans van Etten, his advisor, taught him that "you can be serious about your work, without taking yourself too seriously". Dr. Kistler's first Ph.D. projects were biochemical in nature, working on a *Fusarium solani* (*Nectria haematococca*) and ultimately suggesting reaction mechanisms for the metabolism of phytoalexins by the fungus.

Even before population genetic analysis had been applied to plant pathogenic fungi, Dr. van Etten understood the potential impact of genetic variation on pathogenicity. Studying biochemical differences among strains,

they found significant differences within a species that were related to host range. A genetic approach followed to help define genes of the fungus important for pathogenicity, and Dr. Kistler crossed naturally occurring strains that varied in particular traits. Starting in the mid 80s genes were being cloned and deleted, and the genes that Dr. Kistler defined genetically “the old fashioned way” were being cloned and deleted in strains he had created.

In 1985 Dr. Kistler accepted a faculty position in the Department of Plant Pathology at the University of Florida. His laboratory focused on *Fusarium oxysporum*, a species complex that causes disease on a wide range of agricultural and horticultural crops. They studied basic biology of the fungus including chromosome structure and genetic variation between strains. In addition, they developed methods for transformation of *F. oxysporum*, which had never been accomplished before. Through identification and deletion of conditionally dispensable chromosomes, they were able to demonstrate that these chromosomes contained genes involved in pathogenicity. Dr. Kistler also continued work on *F. solani*, cloning and characterizing a gene cluster on a supernumerary chromosome that determines pathogenicity in *Nectria haematococca*.

Up to this point in his career, Dr. Kistler primarily studied *Fusarium*, and when a position became available at the USDA ARS Cereal Disease Laboratory to work on the very economically important *Fusarium graminearum*, the opportunity arose to reinvent himself in the field of fungal genomics.

Dr. Kistler joined the USDA ARS Cereal Disease Laboratory in 1999, when *Fusarium graminearum* epidemics had been making a come back. Many labs were just getting started studying Fusarium head blight, and the US Wheat and Barley Scab Initiative provided the opportunity for rapid progress. He began collaborations with other labs including Dr. Frances Trail (Michigan State University), Dr. Jin-Rong Xu (Purdue University), Dr. Kerry O’Donnell and Dr. Todd Ward (USDA-ARS NCAUR).

With the release of the *Neurospora crassa* genomic sequence by the Whitehead/ Broad Institute, Dr. Kistler and his collaborators, both national and international, were determined to have the genome of *Fusarium graminearum* sequenced. In March 2001 a group of 10 – 12 scientists from the *Fusarium* community formed The *Gibberella zeae* International Genomics Initiative (GIGI) at the Fungal Genetics Conference at Asilomar, California. The goals of which are “to unite researchers from all areas of the world in order to promote research on the wheat and barley head blight fungus and to support its genome-wide analysis”. Funding for the genome sequencing of *F. graminearum* was eventually secured, and the sequence became publicly available by the Broad Institute in May 2003.

The availability of the genomic sequence has presented the *F. graminearum* community with an almost unimaginable wealth of information. Dr. Kistler has taken the lead and been the driving force behind GIGI. GIGI provides a way to communicate among researchers and helps avoid duplication of work and competition (although he acknowledges that competition can be fruitful). Dr. Kistler organizes yearly meetings of GIGI. More recently, the focus has expanded to include even more *Fusarium* species, and within the next year three additional *Fusarium* genomes will be sequenced: *F. solani* (one of the strains from Dr. Kistler’s Ph.D.), *F. oxysporum*, and *F. verticillioides*.

The genomic sequence itself must be annotated with predicted genes in order for it to be most useful. Initial gene prediction drafts for *F. graminearum* were error prone, though with the additional *Fusarium* species sequences, gene prediction will be vastly improved. Definition of genes according to conservation of open reading frames will be a powerful method of gene prediction.

Dr. Kistler’s laboratory has benefited greatly from the availability of the genomic sequence. According to Dr. Kistler, “Having the genome sequence is like having all the pieces of the puzzle- you just have to fit it together to understand what you want to understand”. For example, if you are interested in spore development you can find these genes... all the genes are there, it’s just a matter of figuring out the essential genes.

Dr. Kistler’s laboratory has used the genomic sequence to develop a genetic map for *F. graminearum*. “The genetic map has worked in really surprising ways of helping us understand regions of the genome which are undergoing rapid change through recombination” says Dr. Kistler. Those regions are likely areas of genome innovation, which are proving to be extremely important for processes like pathogenicity because genes expressed *in planta* that are unique for *Fusarium* are localized in areas of rapid recombination and genome innovation. This has really focused Dr. Kistler and his collaborators on particular areas of the genome and narrowed things down incredibly fast.

After the genomic sequence became available and annotation underway, Dr. Kistler facilitated the process for securing funding and developing the *F. graminearum* Affymetrix gene chip microarray. Designing the chip involved developing a set of gene predictions that were the state of the art. This was done in collaboration with Munich Information Center for Protein Sequences (MIPS). Gene chips are also available for the three major hosts (barley, wheat, rice). This can help us understand the coordination of gene expression from both sides of the interaction.

In addition to working on genomics, Dr. Kistler’s lab also studies the population of *F. graminearum* in the United States. By examining collections of *F. graminearum* strains gathered on yearly surveys, changes can be recognized.

Even though Dr. Kistler is quite busy coordinating the national and international *Fusarium* genomics workers, he still finds time to give seminars and guest lecture courses in the department. He feels that meeting students and teaching can be both “altruistic and selfish at the same time” and he finds teaching satisfying. Teaching helps him sharpen his thinking for research—nothing helps more than having to understand a topic well enough to explain it to a student.

Current members of Dr. Kistler’s lab include: **Dr. Liane Rosewich Gale, Dr. Kye-Yong Seong, Sam Gale, Karen Hilburn and Leslie O’Leary**. Dr. Matias Pasquali from Italy will be joining the lab for two years as a visiting scientist in November 2005. Research projects in the lab currently include: experiments utilizing the Affymetrix gene chip, studying population genetics and dynamics of *F. graminearum* in the US, and functional genomics involving gene deletions in *F. graminearum*.

Dr. Kistler is an ardent baseball fan and is often observed wearing a Twins cap, although his favorite team is the Cleveland Indians. He also enjoys camping with his daughter, Caroline. They try to go to one National Park and one Minnesota Park each year.

Les Szabo: Rust genetics and genomics

By Maria Ordonez

Dr. Les Szabo is a research scientist at the USDA Cereal Disease Laboratory at the University of Minnesota St. Paul campus. Originally from Seattle, he obtained his Bachelor's degree in Biology from Washington State University. His Masters degree in Biochemistry was from Michigan State University, and he later obtained his Ph.D. from Oregon State University. Dr. Szabo has dedicated part of his career to deciphering the evolutionary relationships of rust fungi on cereals, grasses and other hosts. If you are interested in phylogenetics, Les is the man to see.

Dr. Szabo leads a busy upbeat lab with two postdocs, **Charlie Barnes** and **Shaobin Zhong**, and two lab technicians **Jerry Johnson** and **Kim Nyugen**, and he also hosts skillful summer interns every year from other universities. In addition, Dr. Szabo has many recognized national and international collaborators in several of his projects. I am happy to be part of his lab as a graduate student from the Department.

However, phylogenetics is not all that goes on in the Szabo lab. Currently, his lab has been involved in the development of real-time PCR assays for rapid detection of cereal rusts and the Asian soybean rust. He has been active in the efforts put towards facing possible soybean rust epidemics in the U. S. His research also involves the search for avirulence genes of *Puccinia graminis*, and the molecular characterization of gene expression during different stages of development of *P. graminis*.

Dr. Szabo is engaged in the academic world as well. He is an Adjunct Associate Professor in the Plant Pathology Department. For the past two years he has organized the Department's seminar series with **Dr. Jim Bradeen**, and has also been part of several graduate student committees. In 2003 Dr. Szabo received the Mentor of the Year award from the plant pathology graduate students in recognition of his dedication to student guidance.

Les also makes time for his family, participating in his children's curricular and extra-curricular activities which keeps him busy driving around to sporting events throughout the state. He likes the outdoors and enjoys camping and canoeing by the lake, as well as traveling abroad.

Dr. Szabo is a dedicated researcher with many exciting projects going on, of which we will certainly hear more in the future.



The Szabo Lab. Back row: Jerry Johnson, Les Szabo, Shaobin Zhong. Front row: Charlie Barnes, Maria Ordonez, Catherine Butler, and Kim Nguyen.

Deborah Samac: Alfalfa pathology and genomics

By Linda Kinkel

Avid birder. Extreme gardener. Maine coon cat aficionado. World traveler. Devoted and effective mentor to undergraduate, graduate, and post-graduate researchers. Passionate about plant pathology. Thirteen-year member of the University of Minnesota Department of Plant Pathology. These are just a few of the many attributes to include in an introduction to Dr. Debby Samac, USDA-ARS Research Plant Pathologist in the Plant Science Research Unit (PSRU) and adjunct Professor in the Department of Plant Pathology.

Dr. Samac joined our faculty in 1992, with responsibilities for alfalfa pathology and biotechnology research within the five-member team of alfalfa researchers in the PSRU. Her significant accomplishments include developing transgenic alfalfa plants with enhanced tolerance for biotic and abiotic stress, with specific focus on disease resistance and aluminum tolerance. Dr. Samac is among the world leaders in the development of enhanced alfalfa plants using transgenic methods. Dr. Samac has also worked to document the significance of brown root rot on alfalfa (caused by *Phoma sclerotoides*); her work has shed light on the ubiquity of this pathogen, and its probable significance in winter injury in alfalfa stands. Dr. Samac has also developed a PCR assay to identify *Clavibacter* in alfalfa seed. This assay has been useful in quantifying the low seed-transmissibility rate of this pathogen, and in documenting the presence of this pathogen on diverse native North American legumes. Dr. Samac has also been a central player in research on the use of genomic tools in *Medicago truncatula*. In addition to expanding our basic understanding of host-parasite interactions, this research has tremendous potential for creating more disease resistant plants. Dr. Samac's skills with molecular tools as well as her reliability and interpersonal skills have led to her role as a valued collaborator on many additional projects during her time at Minnesota, including research on the use of alfalfa as a biofuel feedstock, production of bioplastics in alfalfa, phytoremediation using alfalfa, and biological control of soilborne diseases of alfalfa. Though her research program has been wide-ranging, Dr. Samac's fundamental commitment remains to the discipline of Plant Pathology, and to



Samac lab members at the Monterey Bay Aquarium. Left to right: Mesfin Tesfaye, Dawn Foster-Hartnett, Deborah Samac, Divya Chandran. Not pictured: Mindy Dornbusch, Lorien Radmer, Jenny Larsen.

reducing the impacts of plant disease on alfalfa productivity.

Though a USDA-ARS scientist, Dr. Samac has taught the Phytobacteriology portion of our Causal Organisms class since its inception and contributes guest lectures regularly to many courses in our program. Dr. Samac has served on countless graduate student committees, and advised M.S. and Ph.D. students in the Plant Pathology and Plant Biological Sciences graduate programs. Her effectiveness as a mentor has been recognized by her TWO-TIME selection by the Plant Pathology Graduate Students as “Mentor of the Year.” Beyond the University, Dr. Samac has served regularly as a Science Fair judge at local public schools, as a volunteer for The Nature Conservancy, and contributed time and energy to local political campaigns.

After 13 years as a professor, Dr. Samac still loves bench work most of all. Her continuing capacity to share this love of research with her students and with her colleagues is appreciated by those of us lucky enough to work with her.

Charla Hollingsworth

Minnesota’s hard red spring wheat crop was hit particularly hard by diseases this year. Early in the growing season, tan spot (caused by *Pyrenophora tritici-repentis*) caused many water-logged wheat fields to turn a ‘sick’ yellow color. As stands were recovering, severe symptoms of bacterial stripe (caused by *Xanthomonas campestris*) killed upper-canopy plant leaves in many fields. Finally, a Fusarium head blight (caused by *Fusarium graminearum*) epidemic added the final blow to an already struggling crop. The season ended with severe and widespread grain yield and quality losses for many producers, regardless of locale.

Without question, crop losses resulting from disease epidemics can be financially devastating for producers, but the same epidemic can provide an ‘opportunity’, of sorts, for plant pathology research. Overall, this was a good year for disease-related research. I conducted experiments in fields that were severely diseased, so copious amounts of data were collected! Results from these studies are expected to contribute to our body of knowledge on the management of Fusarium head blight (FHB) in spring wheat.

Disease data were collected weekly at three experiment locations to determine the value of growing spring wheat varieties with different levels of disease resistance (e.g.: moderately-resistant to susceptible), in diverse environments, and under various disease pressures (Fig. 1). Grain samples from the tests are currently being graded. The cost of each disease management strategy will be compared to grain market prices, to determine profitability estimates of growing wheat. This trial will establish those fungicide/disease resistance combinations that provide sufficient levels of protection against crop loss, both biologically and economically, when disease pressures are high. The project is supported by the Minnesota Wheat Research and Promotion Council, U. S. Wheat & Barley Scab Initiative, Bayer CropScience, Syngenta, and BASF.

Research was conducted for a second year within a 160-acre commercial spring wheat field near Crookston. Data collected from research ‘plots’, measuring a whopping 150 ft. x 1000 ft., will determine whether fungicide application technologies such as droplet size and fungicide-to-water ratios can be manipulated by commercial aerial applicators for achieving increased FHB control. Notable equipment used for the research effort included a(n): 1) airplane; 2) commercially-sized grain combine; 3) weigh wagon, 4) grain cart; 5) 4-wheeler; and 6) motorcycle (Fig. 2). While large-scale research is popular with many producers, equipment and personnel logistic issues are magnified, as well. This project was conducted collaboratively with scientists from North Dakota State University. Application technologies were tested in three experiment locations (e.g.: Crookston, MN; St. Thomas, ND; and Hunter, ND) to increase the statistical power of the test and reduce the risk of a test failure if there were areas with low disease pressure. The effort was supported by the U.S. Wheat and Barley Scab (FHB) Initiative.

My program continues to identify strategies to keep Minnesota farming. Increased input costs resulting from disease management (e.g.: fungicide, tillage) coupled with low commodity prices, exert additional pressures on an already economically stressed agricultural economy. Minnesota producers need our help if they are going to continue to feed the world.



Fig 1: Heidi Michaels and Jenna Prudhomme rating leaf diseases at a test site near Oklee, MN during June.



Fig 2: Harvest included commercial-sized equipment such as a grain combine, weigh wagon, and grain cart. During July, grower-cooperator Gary Hoerner watches with interest.

Brian Steffenson

In May, graduate student **Ben Alsop** took his internship to Diversity Arrays Technology, Pty. Ltd. in Canberra, Australia to learn a new technique (Diversity Arrays Technology or DArT) for rapidly identifying molecular markers for mapping disease resistance genes in wild x cultivated barley crosses.

Graduate student **Pablo Olivera** is continuing work on characterizing disease resistance genes in the wild wheat relative *Aegilops sharonensis*, which is native to Israel. Pablo will be presenting his research results at the 7th International Wheat Conference in Mar del Plata Argentina in late November.

Post-doctoral research associate **Dr. Joy Roy** is working on genotyping with molecular markers an ecogeographically diverse collection of wild barley, *Hordeum vulgare* subsp. *spontaneum*. His goal is to use association mapping to position disease resistance genes in the barley progenitor. Joy traveled to North Carolina State University in May to learn about the latest computer software for conducting this association analyses.

Post-doctoral research associate **Dr. Claudia Castell-Miller** is working on the genetics of spot blotch resistance in barley and also on the inheritance of virulence in *Cochliobolus sativus* on barley in cooperation with Drs. N. Mironenko and O. Afanasenko of the All Russian Institute of Plant Protection in St. Petersburg-Puskin, Russia. She attended the APS annual meeting in Austin, TX this year and presented her research on the genetics of virulence in *C. sativus*.

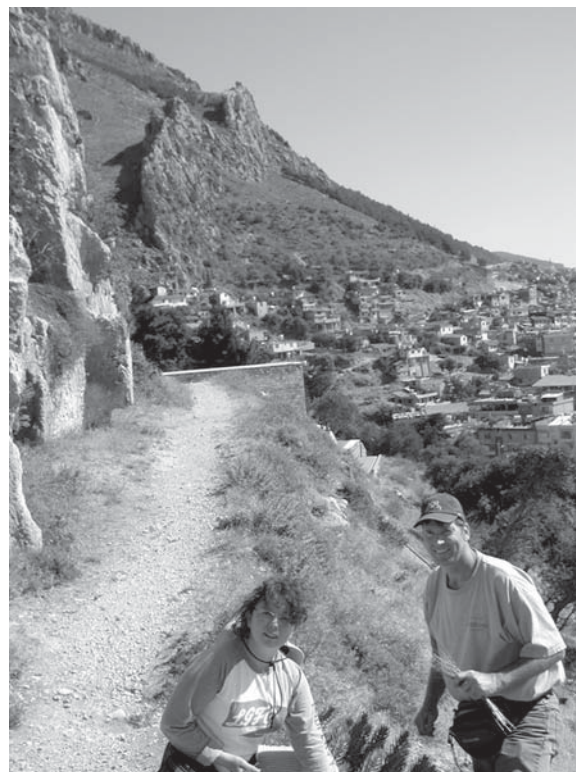
This year I made three international trips. The first was in May to Hangzhou, China where I evaluated barley germplasm for resistance to Fusarium head blight. We have had a cooperative agreement for this work with Dr. Bingxin Zhang of Zhejiang University for 10 years.

The second trip was made in June to Turkey. Ex situ plant collection is an integral part of our long-term goal to introgress useful genes from wild cereal progenitors. Turkey, which lies in the northern part of the Fertile Crescent, is an important region for the evolution of wild wheat and barley species. However, collections from key locales in Turkey are lacking in the US genebanks. To obtain germplasm from this region, **Dr. Hatice Bilgic**, my former post-doctoral research associate, and I submitted a grant to the USDA Plant Exchange Office and were awarded funds for a plant exploration trip to southeast Turkey in June. This project was done in cooperation with Dr. Taner Akar, Dr. Huseyin Tosun, and Dr. Alptekin Karagöz of the Central Research Institute for Field Crops (CRIFC) in Ankara. We covered thousands of kilometers on the trip and passed through the cities of Adana, Osmaniye, Hatay, Kahramanmaras, Gaziantep, Kilis, Adiyaman, Sanliurfa, Diyarbakir, and Mardin. We collected over 240 accessions of wild barley and wheat over a two-week period. We saw some amazing parts of the country (postulated domestication site of einkorn wheat in Karacadag, Euphrates and Tigris Rivers, ancient archeological sites and cities) and experienced the culture (music, food, and dance) of the native Kurdish people. Turkey is a beautiful and fascinating country with so many friendly people.

My third trip was to Australia in September to attend the “Global Landscapes in Cereal Rust Control” conference held in the Blue Mountains resort city of Katoomba, Australia. The conference was held in honor of the many contributions made by Dr. Robert McIntosh (2002 recipient of the E. C. Stakman Award) to wheat, wheat genetics, and rust control. I was invited to give a presentation on exploiting wild wheat and barley accessions for rust resistance genes.



Diversity of spike type in barley landraces.



Brian and Hatice collecting wild wheat in Hatay (Antioch) Turkey

OUTREACH

Southern Research And Outreach Center News

By Senyu Chen

Soybean cyst nematode (SCN) continues to be a major threat to soybean production in Minnesota. The nematode continues to spread toward the north in the Red River Valley. Recently, the infestation of the SCN in Big Stone and Ottertail Counties has been confirmed bringing the total SCN-infested counties up to 54 in the state.

The Nematology Laboratory at the Southern Research and Outreach Center continues to focus on the biology and management of SCN. The major studies included research on the effects of soil biotic and abiotic factors on SCN populations and the interaction between SCN and iron-deficiency chlorosis (IDC). In collaboration with scientists in various departments, research centers, and the extension service, we continue to study various cropping systems for their effects on SCN, other diseases, and pests. This year, a new project was initiated to study various crops affecting SCN, IDC, brown stem rot, and root rot.

Senia Vetter, a M.S. graduate student, evaluated more than 40 crops and plant species in the greenhouse for their ability to lower SCN population density. A few leguminous plants, such as sunn hemp and peas have a significantly greater ability to reduce SCN populations than the most common rotation crop, corn. During the past year, Senia has looked at the mechanisms of selected plant species in reducing SCN populations, and she is wrapping up her research project and preparing her thesis.

Dr. Jingwu Zheng, a visiting scientist from Zhejiang University, China, worked for one year in my laboratory on the St. Paul campus. He studied the SCN races (HG-Type) in Minnesota. About 100 SCN populations collected across the state were evaluated for their virulence phenotypes and the data were compared with the results obtained five years ago. There was no detectable change in the frequency of virulence phenotypes in the state although SCN-resistant cultivars have been used to a certain extent. However, in his study, a change of virulence phenotypes of SCN in some experimental plots was observed after five years of continuous use of SCN-resistant cultivars. Meanwhile, Jingwu developed a new method for evaluating SCN virulence phenotypes. After one year at the University of Minnesota, Jingwu returned to China on September 20 and resumed his nematology research there.

We continue our outreach programs for management of the SCN. The 2005 Disease and Insect Field Tour at the Southern Research and Outreach Center was one of the important events at the Center. This year, we highlighted soybean rust, which has been reported in the southern U. S. and is a potential threat in the North Central region. Other topics included in the tour were the SCN, aphids, and corn root worms. More than 100 farmers and agricultural professionals participated in the tour.

USDA Forest Service, North Central Research Station News

By Jennifer Juzwick

During the 2006 federal fiscal year, the North Central and the Northeastern Research stations will be undergoing changes in preparation for the official merger of the two into one (the Northern Research Station) in October 2006. The decision to combine the stations was announced by Ann Bartuska, Deputy Chief of Research, in August 2005.

Changes in scientific programs and research staff have also occurred within the disease research unit during 2005. **Kathy Kromroy**, Postdoctoral Research Plant Pathologist, finished her work with the unit in late August 2005 and is now working with the Invasive Species Unit of the Minnesota Department of Agriculture in St. Paul. During her four years working with the unit, she completed a historical assessment of oak mortality and decline using USDA Forest Service Forest Inventory and Analysis data. She also worked with a team to document changes that occurred in the oak resource of the seven county Minneapolis-St. Paul metropolitan area and the relationship of these changes to urbanization. Johann Bruhn, University of Missouri, will continue research on *Armillaria* spp. effects on stump sprout regeneration that he and Kathy cooperatively initiated during her tenure. **Mike Ostry**, Research Plant Pathologist, continues to work on a wide range of topics. He and Department of Plant Pathology emeritus **Prof. Neil Anderson** continue to investigate fungal diversity along the riparian to upland forest gradient in northern Minnesota. Mike's other current projects include effect of red pine shoot blights on regeneration in uneven-aged management of red pine, host range of the butternut canker fungus, etiology of widespread black ash decline and mortality in northern Minnesota, and development of a model for hybrid poplar plantation site selection in the state. Since joining the unit in August 2004, **Rob Venette** (Research Biologist – Invasion Biology), has brought seemingly boundless energy and expertise to the unit and the research station. Rob and **Sue Cohen** just completed a model and map for predicting likelihood of *Phytophthora ramorum* establishment in the seven states of the Upper Midwest. Rob's expertise in pest risk assessment and early detection of exotic species are highly valued by the unit and the station. Rob is the son of James Venette, a graduate of the Department of Plant Pathology (early 1970's). **Jennifer Juzwick** is currently enjoying a 6-month leave from administrative duties as Unit Leader to "catch-up" on writing publications and to focus on new and on-going research. Her current graduate students, **Ryan Blaedow** (Ph.D.) and **Maya Hayslett** (M.S.), have expanded her research on propiconazole and on insect vectors, respectively. First as a technician and then as a junior scientist working with Jenny, **Jordan Eggers** contributed much to a cooperative nine state survey that gathered baseline information on *Phytophthora* species in oak forests of two eastern regions. He left the unit in early summer to start his M.S. program at West Virginia University. **Tina Seeland** continues to provide excellent technical support and molecular technique expertise to the unit.

USDA-ARS-Cereal Disease Laboratory-2005 Highlights

By Marty Carson

Rust diseases were in the limelight in 2005 and the Cereal Disease Lab was right in the middle of things. The arrival of Asian soybean rust (ASR) to the U.S. in late 2004 set off a flurry of news reports and research activity. **Les Szabo**, his post-doctoral scientist **Charlie Barnes**, as well **Drs. Kurle and Krupa** in the department have developed an intriguing method of detecting rust spores (including ASR) in rainfall samples using real-time PCR. One aim of the project is to determine if the method can be used for early detection of the arrival of inoculum for disease forecasting. Colleagues at the University of Illinois will be attempting to use meteorological data to back track the origin of spores found in the traps. Our old nemesis, black stem rust of wheat, has reared its ugly head again. This time it is the spread of a new race in Africa. This new race was first detected in Uganda in 1999, but has since spread to Kenya and Ethiopia. This story even made it to the New York Times, so you know it must be big news. Leading the charge and sounding the alarm is our most famous alum, **Dr. Norman Borlaug**. Because of its unique virulence pattern, this new race poses a major threat to wheat production in Africa and south Asia. Concern about this new race is so great that a new Global Rust Initiative is now in the formative stages. **Yue Jin** at the CDL has been vigorously working with this new race and has screened a diverse array of germplasm to determine the vulnerability of U. S. cultivars and to find effective sources of resistance. He has also developed a good relationship with CIMMYT in Kenya and has been instrumental in getting U. S. germplasm screened in field nurseries in Kenya. He will be traveling to Kenya and Ethiopia in October to evaluate these nurseries and visit collaborators.



Old meets new at the Cereal Disease Lab. New construction almost doubles research and office space.



Construction of new general office space in the addition to the Cereal Disease Lab.

Dr. Jin will also serve as a host for two USDA Borlaug fellows from Ethiopia, who will be visiting the CDL this winter to learn stem rust research methods and work with the new African race.

We're growing! Construction began in late March, 2005 on the ~7,000 square foot addition to the Cereal Disease Laboratory. The new addition will include two 750 square foot laboratories, a common prep lab, a BSL-2 containment facility for working on exotic pathogens, as well as a large common office and a conference room/library. Construction of the new addition is expected to be completed by December 2005 or January 2006.

The Cereal Disease Lab hosted several visiting scientists during the year. Yeshoshua Anikster, Institute for Cereal Crops Improvement, Tel Aviv University, Israel spent a couple of weeks working with **Bill Bushnell, Les Szabo, Kurt Leonard, Marty Carson, Alan Roelfs, Dave Long** and **Yue Jin** on several ongoing rust research projects. Dr. Amor Yahyaou from ICARDA visited the lab in November, 2004. Dr. Marc Bardin, a former visiting scientist from France who worked with Kurt Leonard visited the lab while on a family vacation to the states. **Dr. Shaobin Zhong**

joined the Szabo lab as a post-doctoral scientist working on the *P. graminis* genomics project in October, 2004. He has since accepted a faculty position at the University of Hawaii at Hilo.

Plant Disease Clinic

By Amy Holm

As the new diagnostician in the Plant Disease Clinic, I would like to thank the Department for the continued opportunity to provide an update on the activities in the Plant Disease Clinic. I recently returned to the Twin Cities area, and began working at the Plant Disease Clinic in May. I received my Master of Science degree in the field of Plant Pathology at North Dakota State University. After receiving my M.S. degree, I began working for Syngenta Crop Protection, Inc. in November of 2000. As a Research and Development Scientist for Syngenta, I conducted field and greenhouse trials at their North American research center. In addition, I was responsible for diagnosing samples submitted to the lab from greenhouse and nursery growers, and conducting quantitative PCR studies to monitor the sensitivity of plant pathogenic populations to fungicides.

It has been a busy summer in the Plant Disease Clinic. The clinic received approximately 400 hosta samples for Hosta Virus X (HVX) testing. In addition, we received numerous oak samples for oak wilt testing. In total, the Plant Disease Clinic has processed approximately 2,200 samples and phone calls from commercial growers. We have also been working with the Minnesota Department of Agriculture, the National Plant Diagnostic Network, and the Department of Plant Pathology regarding soybean rust state response plans and monitoring efforts. This is our third year working with the National Plant Diagnostic Network, North Central Region, and we have recently implemented a National Plant Diagnostic Network information system. I look forward to 2006 and our continued involvement with projects conducted in collaboration with faculty, growers, and other organizations.

Pesticide Safety and Environmental Education

By Dean Herzfeld, PSEE Coordinator.

The primary work of PSEE is certification and recertification education of licensed pesticide applicators in the state of Minnesota. The PSEE coordinator works with all groups that provide pesticide applicator certification and recertification education. In the commercial/noncommercial programs the largest program efforts are in urban/suburban/industrial pest management areas of turf, landscape, buildings and other structures and public health (mosquitoes). Other major commercial/noncommercial pest management areas include field crops, stored grain, food processing, aquatic, and road/railroad/utility rights of ways.

Here are the numbers of participants in PSEE educational programs for the past 12 months.

For 2005 Private Applicators (primarily farmers) on a three-year recertification cycle. PSEE is the sole provider of private applicator education in the state working in partnership with Regional and Local extension educators and county extension offices.

- * 19,779 total certified private applicators in Minnesota
- * Reached through the PSEE program: approximately 500 newly certified private applicators plus approximately 4,000 recertified applicators for a total of 4,500

Commercial and Noncommercial Applicators have a one- to three-year recertification education cycle, depending upon license category. Many individuals hold more than one pesticide applicator category license:

- * 56,770 total licenses held by 28,671 people in 20 different license categories.
- * New applicators reached through PSEE education: 3,760 new licenses contacts held by 2,415 people
- * Recertifying applicators reached through PSEEP education: 12,497 participants in recertification educational programs with 9,741 individuals.

PSEE is the single largest provider of commercial/noncommercial recertification training in the state. PSEE is now partnered with North Dakota State University in providing a joint recertification workshop for Turf & Ornamental applicators and one for Field Crops Pest Management and Seed Treatment applicators. PSEE also works with extension specialist and industry associations who also provide commercial/noncommercial pesticide applicator education.

Plant Disease Resistance: What Molecular Biology Has Taught Us about Plant-Pathogen Interactions

By Jim Bradeen

We all know that plants have active defenses against pathogens. But have you ever wondered how the plant knows when it is being attacked or how it actually defends itself against pathogens? Flor's gene-for-gene hypothesis suggests that plants carry resistance genes or R genes while pathogens carry avirulence or Avr genes. If the pathogen produces an Avr factor recognized by a plant R protein, a resistance reaction, often characterized by localized cell death known as the "hypersensitive response", results. Flor's hypothesis emerged from careful experimentation at the organismal level. But does the gene-for-gene model hold true at the molecular level?

Today, using the tools of molecular biology we can characterize gene expression on a global basis: essentially providing a snapshot of what genes are being expressed at any given point in time. We now know from several studies examining plant gene expression in response to pathogen attack that plant disease resistance is not the result of a single R gene. In fact, resistance is a complicated phenomenon at the molecular level, the result of several complex, interacting genetic cascades integrating products of several different genes. But all is not lost for Flor's hypothesis. While the resistance phenotype that we recognize in the field or greenhouse results from integrated genetic cascades, the cascades themselves are regulated by R genes.

To date, dozens of R genes have been cloned from a variety of plant species. We've learned that most R genes are structurally similar to one another, regardless of the plant species from which they originate or the pathogen against which they work. In plants ranging from rice and Arabidopsis to conifers and even mosses, R genes tend to share structural motifs. In fact, related genes have even been found in animal species, indicating that the origin of R genes predates the evolutionary split that led to plants and animals. Interestingly, while plant R genes tend to be structurally similar, pathogen Avr genes are very diverse.

From several studies, we have learned much about the cellular role of R genes. One can think of R proteins essentially as "sentinels" and "switches." The R protein's first function is to recognize that the pathogen is present, the role of sentinel. Enter the Avr factor. Through direct or indirect interaction, the R protein senses the presence of an Avr factor. This recognition is commonly highly specialized and even minor changes to Avr factor structure can result in evasion of R gene-mediated detection. Flor's gene-for-gene hypothesis tells us that the plant and the pathogen are locked in evolutionary combat: it is the goal of the plant R protein to detect the pathogen Avr factor and it is the goal of the Avr factor to evade detection by the R protein. So, if the plant recognizes a pathogen, what does the pathogen do? It evolves, modifying (or eliminating) its Avr proteins. In response, the plant modifies or evolves new R protein alleles capable of detecting the new form of the Avr protein. The highly specialized interaction of the R protein and the Avr factor at the molecular level thus supports Flor's observations. Interaction between the R protein and the corresponding Avr factor results in conformational changes in the structure of the R protein. These changes, in turn, trigger the defense response cascades: thus, the R protein also plays the role of a cellular switch to activate genes that ultimately condition the resistance phenotype.

A given plant species has many R genes. Analysis of the complete genome sequence of Arabidopsis has revealed more than 150 putative R genes. Given the specialized interaction between R proteins and Avr factors (which means that a given R protein might detect only one particular race or isolate of a pathogen), this makes good evolutionary sense. After all, the environment is teeming with microbes yet most plants are resistant to most would-be pathogens. Plants need a broad arsenal of R genes to defend against particular pathogen species and races. The large number of R genes found in plants also favors rapid evolution through genetic recombination of similar or dissimilar R genes. In contrast to R genes, the genetic cascades that they regulate are more generalized and more highly conserved. Think about it this way: if you are a plant faced with defending yourself against 100 different pathogens, are you better off evolving 100 different genetic cascades, each independently resulting in a resistance phenotype, or a few, highly effective cascades that are regulated by 100 different switches? Plants have clearly chosen the latter strategy.

We've come along way in our understanding of plant-pathogen interactions since Flor's hypothesis was first proposed. Yet there is much we've yet to learn. Molecular plant-pathogen interactions is a rapidly expanding field and one in which talented scientists worldwide are striving to make gains. As I think about the incredibly elegant genetics that conditions the plant-pathogen interaction, I am struck by one simple thought: this is an exciting time in molecular plant pathology!

Department News

AWARDS

Department Awards 2005

by Deborah Samac

The Department of Plant Pathology at the University of Minnesota holds its annual awards program each spring to recognize the outstanding achievements of students, alumni, friends, faculty, and staff. In 2005 the awards program recognized the following people:

The M. F. Kernkamp Scholarship for 2005 was awarded to **Ed Quirin**. Ed received his B.S. in Biology from Cornell University in 2001 then worked for two years as a technician in an SSR mapping project in pepper. He joined the Department in the fall of 2003 working with Dr. Jim Bradeen. He is currently pursuing his M.S. degree in Plant Pathology under the molecular option. His research project involves the generation and characterization of a resistance gene analog library for the disease resistant wild potato *Solanum bulbocastanum*. Ed served as a teaching assistant for PIPa1002/1005 (Plant diseases and your garden/Plants Get Sick Too.) In this function he showed great dedication to meeting the needs of the students and willingness to contribute "his own time" outside of class by organizing an evening review session. He is also a great advocate for the department and is always willing to meet with visiting potential students and organize social events for the benefit of all students. He was a member of the recent Plant Pathology graduate student symposium committee, and contributed a lot of time and effort to ensure its success.

The F. I. Frosheiser Scholarship for 2005 was awarded to **Ryan Blaedow**. Ryan received a M.S. in Tree Physiology from Purdue University in August 2003 and that same month moved to Minnesota to start a Ph.D. program with Dr. Jennifer Juzwick. Ryan is investigating several aspects of the interaction among the oak wilt fungus, *Ceratocystis fagacearum*, the red oak hosts and the systemic fungicide propiconazole. He is investigating the distribution of the fungicide in roots and the changes in growth and development that are induced by the fungicide. In addition he is investigating the spatial and temporal distribution of *C. fagacearum* in red oak root systems. He has written two research grant proposals to support this work that have been funded. He presented the results of his research at the APS meeting in Austin and also gave a presentation on "Within tree and between tree spread of *Ceratocystis fagacearum* and implications for system chemical control" as part of a special session at the meeting on the origin and spread of *C. fagacearum*.

The Stienstra/Meronuck Travel Awards for this year were given to **Brett Arenz** and **Pablo Olivera**.

Brett attended the joint meeting of the Mycological Society of America and the Japanese Mycological Society in Hilo, Hawaii from July 31 to August 4. He presented a paper on his research on the mycological diversity in and around the historic huts of Antarctica.

Pablo Olivera will be attending the 7th International Wheat Conference to be held in Mar Del Plata, Argentina in the autumn.

He will be presenting a poster on his research on the evaluation of *Aegilops sharonensis* as a source of resistance to wheat fungal pathogens and assessment of the phenotypic and genetic diversity of the Israeli *Ae. sharonensis* collection.

The **Stewart Travel Award** was given to **Sharon Lewandowski** and **Carlos Perez**. Both Sharon and Carlos used the award to attend the *Fusarium* laboratory workshop held at Kansas State University from June 26- July 1 to learn more about *Fusarium* identification, use of molecular techniques in identification, and species concept. These topics will be directly applicable to their research projects and the meeting gave them the opportunity to meet other scientists working with *Fusarium* and visit with faculty and students at Kansas State University.

The **P&A Award of Excellence** was presented to **Dr. Steven Cannon**. Steven received a Ph.D. in Plant Biological Sciences at the University of Minnesota. He is currently a postdoctoral scientist with Nevin Dale Young where he is leading two bioinformatic efforts. He is lead coordinator on the NSF-funded effort to sequence the *Medicago truncatula* genome and is a primary investigator on a separate NSF grant to understand the evolution of disease resistance genes in soybean and related legumes. Steven already has a lengthy publication list with 15 peer reviewed publications, chapters and proceedings. He has given numerous invited seminars here and outside the University. He was a speaker in the Plant Pathology seminar miniseries during fall semester on resistance genes. He has also been a mentor to undergraduates, given guest lectures in classes and is active in the bioinformatics discussion group.

The **Civil Service Award of Excellence** for 2005 was presented to **Joel Jergens** who has worked for the department for the past seven years as a research scientist in the forest pathology lab headed by Dr. Robert Blanchette. He has carried out superb research and has become a specialist that students, staff and faculty go to as a resource person. In addition to his fine work, which is demonstrated in his long list of publications, he has helped numerous graduate students with their research and cooperated with many staff and faculty in our College as well as in Forestry. His pleasant personality and interest and efforts in our department have helped make Plant Pathology a great place to work and study. Joel has worked in several different areas including the histochemistry of infection processes in resistant and susceptible eastern white pine, several international projects involving the degradation of waterlogged archaeological woods in cooperation with the Institute of Nautical Archaeology and the Mariners museum in Virginia, as well as host-parasite interactions in *Aqualaria* (a tropical tree that produces a valuable resin). He is an international ambassador for the Department as well as the University and has cooperated with scientists from Vietnam, New Zealand, Chile and others, both here and abroad.

The graduate students presented **Dr. Jim Bradeen** with the **Distinguished Mentor Award**. The award recognizes Jim's outstanding achievements in teaching in the classroom and laboratory, his contagious enthusiasm for research, and his dedication to mentoring students in seminar preparation and presentation.

The Department recognized **Faye Kommedahl** as a **Distinguished Friend of the Department**. Faye is a long-time friend of the department having been associated with the faculty and staff for over 52 years, since her husband Thor joined the faculty in 1953. Faye has been a strong supporter of Thor's work at the University and his service to the scientific and local community. She is remembered as a gracious hostess by former graduate students and visiting scientists during social functions in their home. Faye is an accomplished writer and illustrator. She was a founding member of the Minnesota Women's Press where she was a writer and copy editor. She continues to volunteer faithfully and enthusiastically at the Minnesota Women's Press even after retiring! This trait must be shared by all Kommedahls! She has been very active in church organizations and in tutoring English to Hmong immigrants. This award recognizes all that Faye has done for the Department and community at large.

Laura Wiegard, the head librarian in the Plant Pathology Library, was also recognized as a **Distinguished Friend of the Department**. Laura came from the Minnesota Legislative Research Library to take day-to-day charge of the Plant Pathology Library. She took introductory Plant Pathology to familiarize herself with the language of the discipline and weeded and reorganized the collection. As she grew familiar with the Department and its research needs, she agreed to participate in new student orientation and in Plant Pathology courses where she has presented electronic methods for information access for materials both within and external to the University of Minnesota library system.

Dr. Thor Kommedahl was presented with the **Lifetime Outstanding Service to Science Award**. Thor is the first person to be honored with this award. It was presented to recognize his exceptional lifetime contributions in research, teaching, and service to plant pathology in particular and to science in a very broad sense. As a faculty member in the Department of Plant Pathology, Thor was a pioneer and scientific leader in the identification, ecology, and biological control of *Fusarium* species. He has been an enthusiastic teacher and mentor of graduate students. He has provided unparalleled service to the American Phytopathological Society as Councilor, President, Editor-in-Chief of *Phytopathology*, and as Acting Editor-in-Chief in the development of the first issue of *Plant Disease*. We also gratefully recognize Thor's ongoing exceptional contributions to science as the editor of the Focus column in *Plant Disease* (which he has done for 20 years!), for indexing all APS journals (which he has done for 40 years!), and for introducing Minnesotans of all ages to science through volunteer work with the Science Museum of Minnesota and the Minnesota Native Plant Society. Thor also provides scientific leadership as a Member of the Style Manual Committee of the Council of Biological Editors, which publishes the CBE Style Manual for scientists in the life sciences, physical sciences, and mathematics worldwide. Throughout all of these volunteer and professional activities, Thor nurtures his sense of humor, enjoys time with family, jogs five days a week, travels throughout the world and hikes, bikes, and botanizes whenever the weather allows.

The **Distinguished Alumnus Award** for 2005 went to **Professor George Hudler**, Head of the Plant Pathology Department at Cornell University. George grew up in the forest product town of Cloquet, Minnesota. He received his B.S. in Forestry (1970) and his M.S. in Plant Pathology (1973) from the University of Minnesota. During his M.S. work on seed dispersal of dwarf

mistletoe, he became fascinated by the fungi. George's enthusiasm for fungi was fueled by the humor and teaching style of Clyde Christensen who taught Introduction to Mycology, and by his advisor David French. In 1976 George received his Ph.D. from Colorado State University, after which the Department of Plant Pathology at Cornell immediately hired him. Dr. Hudler is an accomplished researcher and extension pathologist with an exceptional sense of humor and extraordinary teaching skills. His Plant Pathology 201 course, entitled *Magical Mushrooms and Mischievous Molds* is legendary at Cornell. Professor Hudler has taught this course to more than 3000 Cornell undergraduate students. His best selling book, *Magical Mushrooms, Mischievous Molds* has also achieved unprecedented popularity. Professor Hudler remains the only plant pathologist in the world to have a book reviewed by *Rolling Stones* magazine.

Congratulations to the following people for their achievements throughout the year.

Brian Schwingle: Awarded the **Janell Johnk/APS Council Travel Award** by the American Phytopathological Society to attend the annual APS meeting.

Dean Herzfeld: Treasurer, American Assoc. of Pesticide Safety Educators & Award of Excellence in IPM in School Programming.

Linda L. Kinkel: Senior Editor, *Phytopathology*.

Thor Kommedahl: FOCUS Editor for APS; Webmaster and Associate Editor of the Science Museum of Minnesota Bog Hopper; Park Bugle Press, Secretary.

James Kolmer: promoted Adjunct Professor.

Deborah A. Samac: Associate Editor *JASHS*.

Carol E. Windels received a Meritorious Service Award from the American Society of Sugar Beet Technologists at their biennial meeting in March, 2005 at Palm Springs, CA.

Richard J. Zeyen: Career Acknowledgment; Mankato Free Press

International Activities

A few examples of international research...



Bob Blanchette and Ben Held collecting at an old whaling station supervised closely by Gentoo's penguins.



Blanchette and Held on the Antarctic Peninsula.

Laurence V. Madden Receives E. C. Stakman Award

On October 19, 2005 Larry Madden received the E. C. Stakman Award from the Department of Plant Pathology at the University of Minnesota. This award recognizes Dr. Madden's dedication and enthusiasm for teaching plant disease epidemiology, his distinguished research career, and his service to the discipline of plant pathology. Madden, Professor in the Department of Plant Pathology at Ohio State University is known for his innovative pioneering research in the area of plant disease epidemiology leading to development of models that predict risk of disease outbreaks, rates of disease increase based on population-dynamic principles, and development of disease management strategies. His research has been at the forefront in the development of biomathematical models for spore dispersal of fungal plant pathogens, for dramatically improving understanding of the relationship between disease intensity and yield loss at the plant population level, and in implementing new methodology for validating crop loss and other epidemiological models. He has contributed generously to the discipline of plant pathology through his service as editor-in-chief of *Phytopathology*, first chair of the APS Publications Board, member of APS Council and vice-president and president of APS in 1996-1997.

Dr. Paul Ming Hsien Sun receives University of Minnesota Distinguished Leadership Award

By Deborah Samac and Nevin Dale Young

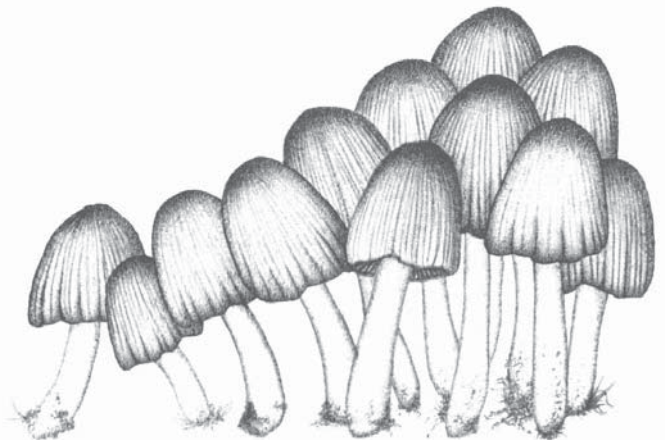
The Department nominated Dr. Paul Sun, who received an M.S. in Plant Pathology from the University of Minnesota in 1966 advised by Dr. Thor Kommedahl, for the University of Minnesota Distinguished Leadership Award for Internationals. He was one of six recipients of the award in 2005. Dr. Sun has been one of the most significant leaders in agriculture in the country of Taiwan over the past few decades. His impressive career began soon after his return to Taiwan after completion of his Ph.D. in Plant Pathology at Purdue University. He has held positions as Chief of the Taiwan Plant Industry Division, Director General of the Asian Vegetable Research and Development Center (AVRDC), and Commissioner of the Taiwan Provincial Department of Agriculture and Forestry. Dr. Sun's commendable rise in government culminated in 1992 with his appointment as Chairman of the Taiwan Council of Agriculture and in 1996 as National Policy Advisor to the President of Taiwan. Though now nearly seventy years old, Dr. Sun continues an active and high profile professional life. He is chairman of the Board of Directors of AVRDC and *Harvest Farm Magazine*, not to mention being Ambassador at Large for the Taiwanese government. Dr. Sun has had a long and distinguished career in research, administration, non-profit governance, national government, and international diplomacy. He is an extraordinary graduate of the University of Minnesota and highly deserving of this award. The Department congratulates Dr. Sun on his accomplishments and on the award.

Thor Kommedahl Receives Award-70 years late

In September 2005, Thor finally received the Boy Scout First Class Badge he earned in the 1930's. Here's Thor's story:

The scoutmaster in Mahtomedi happened to be going through some old scout records (1935) for Troop 89 in Mahtomedi and came across my name. He remembered seeing me at the meeting of the Minnesota Native Plant Society. He e-mailed me asking if I were the same person. He asked more about my activities as a scout in the period from 1932 to 1935 and what scouting was like then. He asked me what rank I held. I had to explain to him that I had completed all the requirement for the First Class badge but the scoutmaster then had suddenly become blind and he resigned as scoutmaster before the award ceremony that would have given me the badge. No one else would take over the troop so the scout troop ended for a few years. When it started up again I was out of high school and at the U of M so I was no longer in the Boy Scout troop. He then asked me if I would talk to his troop about scouting in the thirties and how scouting had affected my life. So I did. Unknown to me, the troop had planned to award me the First Class badge and official status and they got Channel 4 to come out to Mahtomedi and record the event. A complete surprise to me. So, they gave me a shirt, decal for the shirt, and a badge at the end of my talk, and that's what went on TV. It wasn't a special award, it was the awarding of the First Class badge after 70 years. It was a very nice ceremony.

You can view the video clip of the WCCO newscast at: http://wcco.com/local/local_story_271140856.html.



PEOPLE

Examinations Passed: 2005

The following students have recently completed their degrees in Plant Pathology at the University of Minnesota.



Claudia Castell-Miller completed the requirements for a Ph.D. degree under the direction of **Dr. Deborah Samac**. Her thesis was titled “Taxonomy, Molecular and Pathogenic Variability of *Phoma medicaginis* and Visualization of the Infection Process on Alfalfa with Differing Degrees of Resistance to Spring Black Stem and Leaf Spot.” She is currently doing postdoctoral research with **Dr. Brian Steffenson** at the University of Minnesota on genetic analysis of a QTL conferring adult plant spot blotch resistance in barley and genetics of virulence of *Cochliobolus sativus* in barley.



Maria Sanchez received a M.S. degree in plant pathology with an emphasis in molecular plant pathology under the direction of **Dr. James Bradeen**. Sanchez is the first student to matriculate through this new program at the University of Minnesota. Her thesis was “Allelic Mining for Late Blight Resistance in Wild *Solanum* Species Belonging to Series *Bulbocastana*.” She is currently employed by Monsanto Company in Chesterfield, MO.



Jason Smith completed a Ph.D. degree with **Dr. Robert Blanchette** on the topic “Host-Pathogen Interactions in Rust Disease Pathosystems.” Smith is continuing postdoctoral research on several projects, including *Phytophthora* diseases of trees at the University of Minnesota with Blanchette.



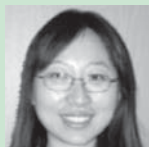
Rubella Goswami conducted Ph.D. degree research with **Dr. H. Corby Kistler** on “Genomic Analysis of Host-Pathogen Interactions Between *Fusarium graminearum* and Its Gramineous Hosts.” She is currently a postdoctoral research scientist with **Dr. Zamir Punja** at Simon Fraser University in Burnaby, British Columbia, working on *Fusarium* pathogens of ginseng.



Jean Rowntree Uhlenhake completed an M.S. degree under the direction of **Dr. Carol Windels**. Her thesis was “Survival of *Aphanomyces cochlioides* Oospores in Soil.” Seminis Vegetable Seeds employs Uhlenhake as a plant pathologist in DeForest, WI, where she is working with **Dr. Lowell Black**.



Jorge Lussio completed an M.S. degree researching “The Effect of *Rhizobium* on the Nodulation of Chemically and Biologically Treated Dark Red Kidney Bean Seed in root Rot Infested Soil in Minnesota.” **Dr. James Percich** directed his thesis research. Lussio will be pursuing employment in Vancouver, BC, Canada.



Haiyan Jia conducted research for her M.S. degree with **Dr. Jim Kurle** on “Evaluating Early Maturity Group Soybean Cultivars and Plant Introductions for Resistance and Partial Resistance to *Phytophthora sojae*.” She will be pursuing a Ph.D. degree in plant breeding and molecular genetics at the University of Minnesota with **Dr. Gary Muehlbauer**, using barley gene chips to study host responses to *Fusarium graminearum*.



Sharon Lewandowski completed her MS degree in Plant Pathology at the University of Minnesota under the direction of **Dr. Bill Bushnell** on “The infection pathway of *Fusarium graminearum* in 6-row susceptible barley.” Sharon is currently working with **Dr. Jim Kurle** at the University of Minnesota on sudden death in soybean.



Silvia Pereyra obtained her Ph.D. degree under the direction of **Dr. Ruth Dill-Macky** in the Department of Plant Pathology at the University of Minnesota. Silvia’s thesis “Epidemiological and Ecological Studies of Pathogenic Fusaria causing Fusarium Head Blight on Wheat and Barley in Uruguay and Prospects for Control” was based on research conducted in Uruguay where she is employed by INIA (National Institute for Agricultural Research) - La Estanzuela. Silvia will continue working on Fusarium head blight and other diseases impacting barley in Uruguay.



Carlos Perez completed a M.S. degree on “Use of green manures to reduce *Fusarium graminearum* survival in wheat residues.” He was co-advised by **Dr. Ruth Dill-Macky** and **Dr. Linda Kinkel**. Carlos will continue his studies at the University of Minnesota pursuing a Ph.D. in Plant Pathology under the direction of **Dr. Robert Blanchette** studying the relationship between pathogens of native Myrtaceae and non-native *Eucalyptus* trees grown in plantations in Uruguay.

Old Timers' News

Roy Wilcoxson visited the department on Monday, March 21.

New employees

Carine Ameline-Torregrosa joined the department as a Postdoctoral Associate working with Nevin Young in April 2005. Carine recently completed her Ph.D. at Universite Paul Sabatier, Toulouse, France. Carine will be conducting research on the comparative genomics of legumes, with special emphasis on the evolution and genome organization of disease resistance genes.

Amy Holm joined the department in May 2005 as a Research Fellow. Amy was hired as the Plant Disease Diagnostician, Plant Disease Clinic, replacing Sandee Gould who retired in June. Amy will also serve as the Minnesota contact for the North Central Plant Diagnostic Network. Amy received her BS from the University of Wisconsin-Madison, an MS in Plant Pathology from North Dakota State University, and is working on her Master of Agriculture in Horticulture at the University of Minnesota.

Crystal Floyd returned to the department in June 2005 as a Research Fellow. Crystal was hired to work with Jim Kurle as a Plant Disease Diagnostician/Coordinator. Crystal will be responsible for providing diagnostic services for soybean rust "first detectors" and soybean rust sentinel plot observer coordination activities. Crystal received both her BS in Science in Agriculture, and MS in Plant Pathology, from the University of Minnesota.



Crystal Floyd

Jennifer Larsen began working with Deborah Samac as a part-time Research Associate in January of 2005. She is working on the Brown Root Rot project in Dr. Samac's lab. Dr. Larsen was an adjunct faculty member at the College of St. Catherine for several years prior to joining the University. She received her Ph.D. degree in Cell Biology from the State University of New York at Stony Brook.

Kye Yeong Song began working in the department as a Postdoctoral Associate in April 2005. Dr. Song was previously held a post-doc position at Purdue University and received his MS and Ph.D. from Seoul National University, Korea. Kye-Yeong will be working on *Fusarium* genomics in Corby Kistler's laboratory.



Amy Holm

Jason Smith was hired as a Postdoctoral Associate in May 2005, shortly after he successfully defended his Ph.D. thesis. Jason will conduct research on the biology and ecology of fungi causing diseases of trees and other woody plants, including genomics and proteomic studies of selected organisms, working with Bob Blanchette.

Farewells

Bacilio and Hilda Salas left the department in January 2005. Bacilio accepted a position as a Plant Pathologist at the Center for Plant Health Science & Technology in Edinburg, Texas. He is working in the Pest Detection, Diagnostics, and Management Lab there.

Shaobin Zhong accepted a position as Assistant Professor in Plant and Environmental Protection Sciences, College of Tropical Agriculture and Human Resources at the University of Hawaii at Manoa, Honolulu, Hawaii, in August 2005.

Janna Beckerman Moves to Purdue University

By Dean Herzfeld

Dr. Janna Beckerman, a familiar face for the past four and a half years in Minnesota's plant pathology and horticultural circles, has started work in a tenure-track fruit pathologist position at Purdue University in Indiana. Her new responsibilities are split between statewide extension work in fruit and ornamental crops and teaching on campus.

In Minnesota Janna utilized her considerable research and educational expertise for extension pathology work in woody ornamentals and was part of the long-running University of Minnesota Yard and Garden Clinic. In addition, Janna developed an on-line Master Gardener course, was involved in teaching day school classes, and became an important player in Extension's urban and horticultural programs. In recent years she responded to industry and other research and extension education demands in turf pathology, rose and vegetable diseases, new and re-emerging diseases such as Sudden Oak Death, Dutch Elm Disease and other important and new nursery, greenhouse and landscape plant diseases. She has a very extensive list of extension and other publications, seemed to speaking somewhere almost every day during the winter, and was an A-list speaker at all important horticultural events large and small.

Janna has the energy for high production, as anyone who has worked with her quickly finds out. She is very able at capturing extension audiences through her many unique and memorable attention getters, which once experienced you never forget. Janna developed strong working relationships within extension and with industry and was not unfamiliar to the public through the media. Dr. Beckerman's many friends and colleagues here in Minnesota wish her well in her new endeavors.

Sandra Gould Retires from the University

By Deborah Samac

On June 30, 2005, Sandee Gould retired from her position as Plant Disease Clinic Diagnostician at the University of Minnesota. Sandee has been the cornerstone of the Clinic for decades and is very highly regarded by professionals and home gardeners in Minnesota and the Midwest region. Operating with a very tight budget and only part time help, she has processed thousands of samples yearly, all in good humor and with a smile. At her retirement tea she was lauded for her highly skilled expertise in plant disease diagnosis, particularly of oak wilt, for which she was instrumental in developing diagnostic methods and means to culture the pathogen. As a token of their appreciation, for many years of help to their business, Kris McArthur of Len Busch Roses presented her with a bouquet of long stemmed red roses. Although she stated that she wants to take some time to relax and put her feet up, Sandee has been spotted back at the microscope in the Clinic on several occasions. We hope she will continue to visit, because she will be missed, and wish her many pleasant days and new adventures during the coming years.

New Students

Ann Impullitti. Ph.D. Fall 2005. Ann is from Sturgeon Bay, Wisconsin and received her B.S. from Northern Michigan University in Marquette in 2000. She received her M.S. degree from the Department of Plant Pathology at the University of Wisconsin-Madison in 2003. After exploring careers in pharmacy, Ann determined that pharmacy was not the career track for her. She is working with Dr. Dean Malvick on studies of soilborne fungal pathogens of soybean and their colonization of soybean using quantitative, real-time PCR and other approaches.

Plant Pathology Education Summit

By Linda Kinkel

On March 17, 2005, the Plant Pathology Faculty met at Luther Seminary to review the status of our graduate and undergraduate curricula and to prioritize our goals for our curricula in the coming years. Though to many of us it may seem like we just finished reviewing and revising our curriculum, the transition from quarters to semesters is now seven years old! During this time we have had faculty retirements and the arrival of new hires, as well as additions and losses of courses. With many pressing issues and requests from outside our program to take on new teaching responsibilities, our faculty met to resolve specific questions as well as to think broadly about the missions of our undergraduate and graduate teaching programs. The retreat generated consensus on urgent issues faced by our program, and draft mission statements and a comprehensive “to do” list for our Education Committee. Discussion of our curriculum and its place in the new collegiate structure will continue to occur over the coming year.

APS Annual Meeting

By Yue Jin

The 2005 APS Annual Meeting was held July 30 – August 3, 2005 in Austin, Texas, with more than 1,300 attendees. The meeting started with the Plenary Session focusing on the future of plant pathology. Interestingly, two of the speakers were emeritus professors, articulating their vision for our future, of course drawing on the wealth of their professional experiences and the rich history of our society. A noticeable change for the better: the opening reception was held in the exhibit-poster hall, which enhanced the opportunities for networking and for reading posters while enjoying beverages. A number of symposia were organized to update attendees on the development and progress in various areas related to plant and human health. The sessions listed by APS as “Hot Topics” included: responses to soybean rust in the U.S., aquatic pathology, endophytes, permitting and global movement of plant pathogens, and science and scientific exchanges. The main reception event on Tuesday evening, called “Lone Star Jamboree” featured live country music by the Mark Winston Kirt Band, cowboy boots and hats, good “ole” Texas barbeque, and Texas two-step lessons. The music from the waterholes in the downtown area of Austin was within earshot distance of the hotel, and we were obligated to listen to country music late into the night even though some of us preferred sleep. There was no mistake that “you-all in Texas” and in the Austin city limits!

SOCIAL EVENTS

International Holiday Celebration

By Carol Anderson

The International Holiday Celebration for 2004 was another resounding success and was attended by many retired faculty members and their spouses, who have continued the tradition over many years of bringing their “famous” dishes to share. The celebration culminated with the awarding of the winners of the hall-decorating contest. The winners were as follows: 4th floor Stakman received “Sympathy Vote,” 2nd floor Christenson received “Honorable Mention,” and 3rd Floor Christenson won both “Best Display” and “Most Unusual Object in a Holiday Theme.” Carol Ishimaru, who was doing it for the first time, and Carol Anderson did judging of the displays.



Brett Arenz accepts 2nd floor award.



Jen Flor represents 3rd floor Christenson Labs.



Jean Rowntree accepts the 4th floor's award.

SPORTS

Stakman Game Goes to the Faculty/Staff

By Ann Arendt

The results of the annual Stakman baseball game are in: Students 6 - Faculty/Staff 11. Each side played tough, but even with the help of a walk-on ringer (Dan Ishimaru), the students weren't able to counter a third inning, 8 run onslaught by the faculty/staff. The weather was perfect and no was injured, although Eric Smith tried his best by sliding into home and then into the metal backpost!

After the game, we headed back to Borlaug where Ann, Nancy, Sagar, Carol A., Mike, Tom and their helpers prepared a terrific barbeque of brats, burgers, and dogs- perfect ballgame cuisine. “Coach” Amar Elakkad accepted the game trophy on behalf of the Faculty/Staff team, and the Students vowed a comeback next year.

VITAL STATISTICS

Marriages

Senia Vetter married David Warnke on August 13, 2005 at her parents' home in Wausau, Wisconsin. David is a pharmacist at the Mayo Clinic, Rochester, MN.

Births

Old timer Andrea Morse, now Andrea Adie, had a baby girl, Emily Corene Adie, on Sept. 5, 2005.

Benjamin Held had a baby girl Abigale Christine Held, 7 lbs 6 oz., on October 2, 2005

Shelley Wang gave birth to a daughter on April 16, 2005. She weighed 6 pounds 12 ounces and was 20.2 inches long. She and her husband finally agreed on the following names: her “English” name is Ellen and her Chinese name is “Ming Fei,” which, according to Shelley, “implies Minnesota's blooming spring season.”

Liyong Zhang and her husband are the proud parents of a baby boy, born July 29. He weighed in at 6 pounds 12 oz. and was 21 inches long.

SEMINARS

Plant Pathology Seminars, Spring and Fall 2005

Spring 2005: Miniseries on Genomics of Plant Pathogens

- Feb 14** Dr. Carol Ishimaru, Department of Plant Pathology, "Club-shaped bacteria in the battle for plant pathogenicity: genomic exploration of weaponry"
- Feb 21** Dr. Corby Kistler, USDA ARS Cereal Disease Lab "Kill the head and the barley's dead: Pathogenomics of *Fusarium graminearum*"
- Feb 28** Dr. Sophien Kamoun, Ohio State University "Reprogramming the host: The secretome of *Phytophthora infestans*"
- Mar 7** Sharon Lewandowski, Department of Plant Pathology
- Mar 21** Dr. Paul Peterson, Clemson University "Barberry Eradication in Minnesota: Past, Present, and Future."
- Mar 28** Carmen Gavin Vanegas, Department of Plant Pathology
- Apr 4** Dr. Jennifer Juzwik, USDA Forest Service "Insect transmission of *Ceratocystis fagacearum*"
- Apr 11** Carlos Perez, Department of Plant Pathology
- Apr 18** Dr. Roger Wise, USDA ARS, Iowa State University "Interplay of gene-specific resistance to barley-powdery mildew and the suppression of host-responses"
- Apr 25** Paul Meyer, Department of Plant Pathology
- May 2** Ryan Syverson, Department of Plant Pathology
- May 9** Dr. Liane Rosewich Gale, USDA ARS Cereal Disease Lab "Fusarium graminearum in the U.S.: heterogeneous and in flux"
- May 16** Dr. Sally Miller, Ohio State University, Wooster "Molecular approaches to plant pathogen identification, detection and quantification: Enhancing the first step in disease management"

Fall Semester 2005

- Oct. 3** Dr. Christopher Lawrence, Virginia Bioinformatics Institute, "*Alternaria* pathogenomics: Interactions with plants and humans"
- Oct. 10** Dr. George Hudler, Plant Pathology, Cornell University, "Magical Mushrooms, Mischievous Molds – Evolution of a Cornell Tradition"
- Oct. 17** Ms. Maya Hayslett, Plant Pathology, University of Minnesota
- Oct. 24** Dr. Ruth Dill-Macky, Plant Pathology, University of Minnesota, "Studies of *Fusarium* in the USA and Australia"
- Oct. 31** Mr. Ryan Blaedow, Plant Pathology, University of Minnesota
- Nov. 7** Brian Schwingle, Plant Pathology, University of Minnesota
- Nov. 14** Dr. Tim Friesen, USDA ARS, Northern Crop Science Laboratory, "Investigation of the role of host selective toxins in the *Stagonospora nodorum* - wheat interactions"
- Nov. 21** Dr. Linda Kinkel, Plant Pathology, University of Minnesota, "Ecology of antibiotic-producing *Streptomyces* in agricultural and prairie soils"
- Nov. 28** Mr. Ben Aslop, Plant Pathology, University of Minnesota
- Dec. 5** Dr. Yue Jin, USDA ARS, Cereal Disease Laboratory, "New virulence of stem rust in Africa and resistance in U. S. wheat"
- Dec. 19** Dr. Eric Jackson, USDA ARS, Small Grains and Potato Germplasm Lab, "New assays for characterizing crown rust resistance in oat"

2005 Graduate Student Symposium

By Brett Arenz

On April 7th, the annual (more or less) graduate student symposium was held in the Continuing Education and Conference Center. The topic for this year was "The Role of Plant Pathogens in Natural Ecosystems" and featured six speakers from around the country who are specialists in this field. The event was a great success and feedback from both audience members and speakers was quite favorable. There were 84 total participants representing faculty, staff, and students from the departments of Plant Pathology, Ecology & Evolutionary Biology, Horticulture, Entomology, Agronomy & Plant Genetics, Conservation Biology, Plant Biology, and Soil, Water & Climate. The organizing committee would like to thank all who attended and especially our speakers and sponsors who helped make this event possible.

Sponsors:

Department of Plant Pathology
College of Agricultural, Food, and Environmental Sciences
Center for Community Genetics
Administrative Grant for Student Initiatives Committee, Student Activities Office



Graduate Student Symposium. Front Row (left to right): **Organizing Committee:** Brett Arenz, Pablo Olivera, Haiyan Jia, Senia Vetter, Ed Quirin. Back row: **Organizing Committee:** Jorge Lussio, Brian Schwingle, Ben Millett, **Speakers:** Dr. David Spooner, Dr. Timothy Todd, Dr. Gregory Gilbert, Dr. Sunny Power, Dr. Janis Antonovics, Dr. Dave Rizzo. Not Pictured: Jean Rowntree.

Graduate and Professional Student Assembly
University of Minnesota Academic Initiative in partnership with
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Geoffrey Ainsworth
Janet M. Alexander
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V

Veteran Fire Fighters Association

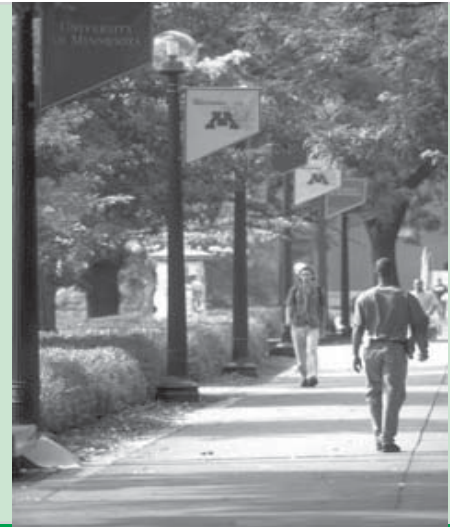
W

W. A. Cleary Chemical
Corporation
W.K. Kellogg Foundation

Westbridge Ag Products
West Central Regional Airshed
Zone
Management Society
Wilbur-Ellis Company

Z

Zeneca Agricultural Products,
Inc.



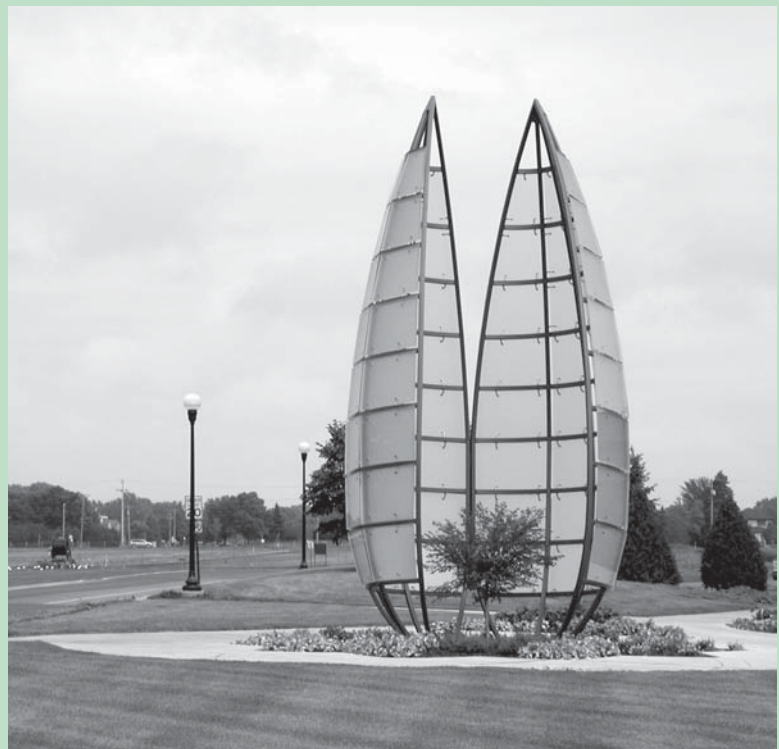
The Aurora Sporealis 2005

www.plpa.agri.umn.edu

Devastating Diseases

Seed of Knowledge

A 22-foot high sculpture made from glass and steel is now in front of the Plant Growth Facility. It was created by Iranian artist Alavi and commissioned by the University of Minnesota Public Art on Campus program at the Weisman Art Museum. Inspired by the shape of an apple seed, the sculpture is tilted backward and cracked open to reveal a live tree growing in its center. The exterior of the seed is also designed to look like a greenhouse for the single tree inside.



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