APS Fellows

The Society grants this honor to a current APS member in recognition of distinguished contributions to plant pathology or to The American Phytopathological Society. DOI: 10.1094/PHYTO-97-0019

Stella Melugin Coakley

Stella Melugin Coakley grew up on a small farm in the central San Joaquin Valley near Modesto, California. She earned a B.S. degree in plant sciences and an M.S. and Ph.D. in plant pathology from the University of California at Davis. After receiving her Ph.D. degree in 1973, she moved to Colorado where she joined the faculty of the University of Denver, first as a visiting professor and later as an associate research professor in biological sciences. From 1975 to 1976, she was a post-doctoral fellow at the National Center for Atmospheric Research in Boulder. In 1988, Coakley moved to Oregon State University where she served as professor and head of the Department of Botany and Plant Pathology for over 15 years. Since 2004, she has served as professor and associate dean for the College of Agricultural Sciences at Oregon State University.

Coakley is internationally known for her research on the relationships among climate variation, global climate change, and plant disease epidemics. Her pioneering modeling work helped establish relationships between climate variability and the probability of occurrence of epidemics of wheat stripe rust and other diseases on a regional scale. This work required a great deal of finesse to estimate the direct effect of climate from among the complex of variables that determine plant disease epidemics. An outgrowth of this initial work was applied to the topic of global climate change. Coakley is frequently sought to write reviews and give presentations on this important and timely topic. Her selection to serve on the Scientific Steering Committee of the Global Change and Terrestrial Ecosystems Program, a project of the International Geosphere Biosphere Program, is also a testament to her stature in this field. In Oregon, an additional research focus has been on development of Septoria diseases of wheat as related to environmental factors, and use of that information to manage those diseases. Her research contributions have been recognized through invitations to make presentations at international conferences and workshops in Australia, Denmark, Spain, Ecuador, United Kingdom, Philippines, Germany, Japan, Poland, and New Zealand.

A hallmark of Coakley's career is her dedicated scientific leadership, which is best described as service to students, colleagues, and profession. To such service, she has devoted enormous energy and initiative in a wide range of venues at Oregon State University and across the state and nation. She has a special talent for bringing together individuals of diverse interests and motivations in collaborations for the common good. Because of this talent, she has been repeatedly called upon to assume leadership roles. As head of the Botany and Plant Pathology Department at Oregon State University, Coakley was responsible for statewide extension, research, and teaching programs in botany and plant pathology. She is known and appreciated for her strong advocacy of departmental programs and faculty and for her remarkable success in building both the collegiality and the scientific strength of the department and university in a time of budget shortfalls. As department head, Coakley fostered relationships with alumni and leaders of the agricultural industries, establishing numerous endowments that fund seminar speakers, graduate student travel, scholarships, and other academic activities. Despite the demands of her position as department chair, she continued to serve as an undergraduate advisor and co-taught a student orientation course because she recognized the need to stay abreast of student concerns. A strong proponent of collaboration between departments and colleges, Coakley served as the president of the Oregon State University Faculty Senate in 2004 and has provided leadership for a variety of multi-department projects throughout her career. She was the principal investigator in a large grant from the Alfred P. Sloan Foundation that served to make Oregon State University the flag-ship institution in the Pacific Northwest for the development of internship-based Professional Science Masters Degree Program. The Sloan initiative has generated new professional science masters degrees at Oregon State University, thereby fostering new and mutually beneficial links between industry and academia. As associate dean of agricultural sciences, Coakley is a visionary leader and proponent for all plant sciences at Oregon State University, and has been a strong supporter of the funding and implementation of a major university-wide initiative in computational and genome biology. Her personal efforts and initiative have been instrumental in identifying and creating new opportunities to further the educational and research missions of Oregon State University and the larger academic and professional community of which it is a part.

Coakley has also provided scientific leadership at the national level, chairing a task force to improve post-award management for the USDA/CSREES, in Washington, D.C., in 2002 and 2003. Due to her strong leadership of the task force, many of the recommendations were implemented, which resulted in higher quality CRIS reports for the agency while reducing reporting burdens for the grant recipients. Coakley has an exemplary record for scientific service. Both within the field of plant pathology and in broader areas of scientific endeavor, her record of unselfish service for the common good is matched by few. She has been active in many scientific societies including the American Association for the Advancement of Science, the American Meteorological Society, the International Society of Plant Pathology, and especially The American Phytopathological Society.

She was chairperson of the APS Foundation from 1997 to 2001, and led the foundation through a period of tremendous growth when the highly successful graduate student travel awards were established. She also served as vice president and president of the Pacific Division from 1992 to 1994, as chair of the Epidemiology Committee, and as associate editor of *Phytopathology*. She currently serves as chair of the APS Public Policy Board, working toward the goal to increase federal support for research, teaching, and extension in all areas of plant health management. For her distinguished record of scholarship and leadership, she was elected a fellow of the American Association for the Advancement of Science in 2000.

Ralph A. Dean

Ralph Dean received his undergraduate degree in botany from the University of London (England) in 1980 and his Ph.D. degree in plant pathology from the University of Kentucky in 1986. Following a postdoctoral appointment at the University of Georgia, he joined the plant pathology faculty at Clemson University where he also chaired the interdisciplinary program in genetics and was associate director of the Clemson University Genomics Institute. In 1999, he joined the Department of Plant Pathology at North Carolina State University as a professor. In 2001, he also became the founding director of the Center for Integrated Fungal Research. In 2004, he received the Secretary's Award of Honor from the USDA and the Huxley Memorial Medal from Imperial College, London. In 2005, he was appointed as a William Neal Reynolds distinguished professor in plant pathology. He is currently a senior editor of *Molecular Plant Pathology* and has served as senior editor of *Phytopathology*. He has served on numerous USDA and NSF grants panels.

Dean has established an internationally recognized research program. He has done this through his creativity, a vision for the future direction of science, and strong leadership. Early on, he chose to focus on *Magnaporthe grisea*, the rice blast fungus, as his experimental system based on the economic importance of this pathogen and its tractable genetics. At the time, few researchers, other than those in industry, were conducting fundamental studies on this organism. In his initial work, Dean conducted elegant studies on the infection process by the fungus that led to the identification of a cAMP-dependent kinase signaling cascade necessary for infection-related development and penetration of the host tissue. Further research showed that this signaling pathway was absolutely necessary for pathogenicity and involves communication between the host and the pathogen. Dean was among the first to embrace genomic approaches for the advancement of our understanding of plant pathogenesis and is widely recognized as a leader in the microbial genomics community. Again, he chose *M. grisea* as the focus of his principle genomic efforts. As new tools for genomic analysis became available, Dean was quick to realize their power for understanding the complex interactions between two organisms. He embraced these tools and set out to sequence the genome of *M. grisea*, starting with chromosome 7. Through his determination and leadership, he obtained funding from the USDA and NSF to complete the entire sequence of *M. grisea*. These endeavors led to the release of the complete sequence and genomic organization in an article in *Nature* in 2005. He also has played a leading role in decoding the rice genome. His most recent efforts have focused on a functional analysis of the interaction between rice and the rice blast fungus, employing gene expression profiling, large-scale mutagenesis, and proteomics approaches to define the transcriptional networks governing the host–pathogen interaction.

Dean's portfolio includes a truly exceptional publication record of over 50 refereed publications and numerous book chapters and reviews in prestigious journals. The distinctive characteristic of the quality of his publication portfolio is that 11 of these publications each have over 50 citations. While some of these publications document his leadership in fungal genomics, many document his substantial contributions to understanding the molecular basis of fungal development, using appressorium development as a model, and his willingness to share expertise with applied programs. While he receives most of his recognition for his work with *M. grisea*, he has additional genomics projects on fungi of industrial importance such as *Trichoderma* and *Aspergillus* and is also identifying host genes for resistance to *Fusarium* in cucurbits. He was also issued patents for a fungal diagnostic assay as well as for detection of a disease resistance gene. Evidence of his prominence in the genomics field is his position on the steering group for the Fungal Genome Initiative hosted by the Whitehead Institute that is partially supported by the Human Genome Initiative at NIH. He is also a lead member of the International Rice Blast Initiative. Dean has supervised 19 graduate students and 15 post-doctoral fellows, several of whom hold faculty positions at leading research universities.

In addition to his core research activities, funded from a variety of federal and industrial sources, Dean is also engaged in departmental responsibilities as well as local outreach programs. He is frequently called upon by university officials to represent the university in genomics issues. He and his research group have developed an innovative outreach program on genomics that is coordinated by Science House, an educational outreach program at NC State. This includes programs for students and teachers. Dean's research group is also active in exhibits such as the genomics program at the NC Museum of Natural History and at the NC State Fair. One of the most innovative outreach programs developed by Dean and his group is the Summer College for Biotechnology and the Life Sciences (SCIBLS). SCIBLS is an opportunity for talented high school students to learn about molecular biology through hands on experience with cutting edge techniques and to interact with college students and faculty on a daily basis. In addition to experiencing the university environment, students tour research facilities in the nearby Research Triangle Park where they hear first hand about careers in science. Dean has developed a world class research program that has received accolades at all levels and is distinguished by a novel outreach program. These attributes all warrant his receipt of the Fellow Award from The American Phytopathological Society.

Anne E. Desjardins

Anne E. Desjardins was born in Bangor, Maine. She received a B.A. degree in chemistry from the University of Maine in 1971. In 1974, she began graduate studies in biochemistry at Emory University, completing her M.S. and Ph.D. degrees in 1976 and 1979, respectively. After graduating from Emory, Desjardins joined the lab of Peter Albersheim at the University of Colorado. In 1981, she moved to Cornell University and worked with Hans VanEtten on pisatin demethylase from *Nectria haematococca*. Desjardins joined the USDA-Agricultural Research Service in Peoria, Illinois in 1984 where she now holds the position of research biochemist.

Desjardins is an internationally recognized authority in *Fusarium* mycotoxicology and a leader of research with an unprecedented combination of molecular biology and genetic engineering, natural products chemistry, and plant pathology under realistic field research conditions. This research has made progress toward solving the intractable problems of *Fusarium* mycotoxins in agricultural commodities. Original insights include identifying biological diversity of mycotoxigenic *Fusarium* species in unique agroecosystems; identifying, developing, and utilizing systems for classical genetic analysis of mycotoxin production in *Fusarium*/*Gibberella* species; applying classical and molecular genetic systems to test the importance of mycotoxins and phytoalexins in plant disease; and field testing of genetically engineered plant-pathogenic fungi. Desjardins' broad research experience, diversi-

fied interests, and creative insights in the area of plant–fungal interactions have led to the development of novel approaches and methods for study of the complex natural systems where mycotoxins occur. Desjardins is internationally recognized for the first rigorous demonstration of the significance of any mycotoxin (trichothecenes) in plant pathogenesis, and for the first USDA-APHIS approved field test (in 1994) of any genetically engineered plant-pathogenic fungus.

As part of a multidisciplinary team, Desjardins plied her skills in chemistry and biochemistry to resolve the biosynthetic pathway of the trichothecene mycotoxins in *F. sporotrichioides* and *G. zeae* and more recently the fumonisin pathway in *G. moniliformis*. Building on these studies, she and her colleagues showed that the pathway enzymes for both of these mycotoxins are encoded by gene clusters. Desjardins also used classical genetics and genetically engineered strains to show that trichothecene mycotoxins are virulence factors while the production of fumonisin is not required for *G. moniliformis* to cause maize ear infection and ear rot. Her work on the role of trichothecenes in the virulence of *G. zeae* has provided the foundation for other research programs in the United States, Canada, and Austria aimed at improving head blight resistance in wheat using genes that confer trichothecene resistance.

Desjardins is senior author of 39 and co-author of an additional 39 refereed journal articles. She is recognized as an expert in plant–fungal interactions, in roles of fungal and plant secondary metabolites in plant disease, and in application of rigorous methods of classical and molecular genetics to study complex agricultural systems. Her international stature, recognition, and impact are evidenced by 26 invited review articles and book chapters. She has just completed a book published this year by APS PRESS entitled, *Fusarium Mycotoxins*: *Chemistry*, *Genetics*, *and Biology*. Widely sought as a speaker for national and international meetings, Desjardins has given 85 invited presentations.

Desjardins has also served the discipline of plant pathology through service on grant panels and study sections, and as a member on editorial boards. She served as a member on five USDA/NRI Plant Pathology Panels and as manager in 1994. In 2004, she served as a member of the USDA/NRI Plant Microbe Associations Panel. Desjardins served as an associate editor of *Phytopathology* and she currently is an associate editor for both *Fungal Genetics and Biology* and *Applied and Environmental Microbiology*, and is on the advisory board of the *Journal of Agricultural and Food Chemistry*.

Throughout her career, Desjardins has maintained a strong interest in international agriculture, especially in Nepal where she was a Peace Corps volunteer. In 1997, she was awarded a Fulbright Fellowship for research on natural occurrence of *Fusarium* mycotoxins in Nepali food grains and the effect of traditional methods of food processing. Under this program, Desjardins worked for 6 months in the Plant Pathology Division of the Nepal Agricultural Research Council near Kathmandu, Nepal. She identified *Fusarium* species, analyzed trichothecenes and fumonisins in food grains by enzyme-linked immunosorbent assay methods, and trained Nepalese scientists in *Fusarium* mycotoxicology. This work aided maize breeders in Nepal and at CIMMYT in developing germ plasm resistant to ear rot. This work was featured in a symposium on international perspectives on food safety and security at the 2001 Annual Meeting of The American Phytopathological Society and on the APS website. In early 2006, Desjardins completed her seventh trip to Nepal, working for 3 months as a U.S. Embassy Science Fellow on the use of biotechnology to conserve plant biodiversity in Nepal.

Desjardins also was awarded a National Agricultural Library Travel Grant for a visiting Chinese scientist to collaborate on a 2000 NAL website article entitled, *Recent Advances in Wheat Head Scab Research in China.* This work is a translation and critical evaluation of 174, mainly Chinese language, articles published since 1980 on the biology of *G. zeae*, breeding for resistance, and other methods for disease control in China. In 2004, she collaborated on a new NAL website article entitled, *Milho*, *Makka*, *and Yu Mai*: *Early Journeys of Zea mays to Asia*, which chronicles the post-Columbian migration of maize to Nepal, China, and other Asian countries. Both articles have been widely used, with up to 5,000 web views per month for the article on maize in Asia.

Clearly, Desjardins is an internationally recognized expert/leader in the biochemistry and genetics of secondary metabolite biosynthesis in fungi. Her body of work on *Fusarium*; her reviewing and editing responsibilities for *Phytopathology*, *Fungal Genetics and Biology*, and other microbiology journals; her review articles on *Fusarium/Gibberella*; and her book on *Fusarium* demonstrate that she is a world leader in fungal biology, particularly *Fusarium* biology.

Helene R. Dillard

Helene R. Dillard was born and raised in the San Francisco Bay area. She received her bachelor degree from the University of California at Berkeley in 1977, and then traveled eastward to the UC Davis campus where she received a masters degree in soil science and a Ph.D. degree in plant pathology in 1979 and 1984, respectively. She then made a more distant move eastward in 1984 to join the faculty of the Department of Plant Pathology at Cornell University's New York State Agricultural Experiment Station in Geneva, NY. Dillard was assigned research and extension responsibilities for vegetable crops. She was promoted to associate professor in 1990 and to professor in 1998.

A wide variety of vegetable disease problems exist throughout New York State, which provided Dillard with ample opportunity to explore and address many important needs of the agricultural community. Early in her job at Cornell, Dillard needed to determine which of these were most important from a research and grower perspective. Her excellent mentoring at UC Davis by Drs. Ray Grogan and Denny Hall allowed her to maintain diversity in her program, yet focus on critical and productive research and extension topics. Throughout her career, she made wise and carefully informed choices that have clearly benefited New York agriculture, Cornell University, and plant pathology in general.

Her work has always been directed toward the identification, biology, and management of foliar diseases in vegetables. She specialized in several major fungal genera, including *Sclerotinia*, *Botrytis*, *Colletotrichum*, *Puccinia*, and *Alternaria*. Working with *P. sorghi* on sweet corn, she and her colleagues established that the alternate host did not serve as an overwintering reservoir, identified the impact of this rust on yield components, and developed action thresholds that allowed growers to determine the proper timing of control measures. *S. sclerotiorum* is a major disease on cabbage and snap beans in New York. Dillard found that the host range included plant species of common weeds such as velvet leaf and ragweed, but more importantly, there was considerable variation in the pathosystems to the extent that management strategies had to be tailored to specific pathogen/host populations. With fewer chemical control options available to growers, it became imperative that management strategies for white mold were matched to the local conditions. Dillard also provided substantive information on the management of tomato diseases using approved organic methods and explored biological control of *S. sclerotiorum.*

Her enthusiasm for extension work is infectious. She assisted and trained county and specialist extension educators on the finer points of vegetable diseases and their management. Dillard was quickly embraced by growers and the vegetable industry. Her ability to impart useful knowledge was equaled by her warm personality and humor. This excellence in extension work was recognized by the New York Association of Agricultural Agents in 1991 and The American Phytopathological Society in 1992. This work was also setting the foundation for her future roles at Cornell.

While maintaining her activities in research and extension in vegetables, Dillard was nominated to participate in the National Extension Leadership Development (NELD) Program in 1997. In the same year, she also began a 4-year term as chair of the Geneva department. Her leadership skills were quickly recognized and in 2001, she was asked to oversee all agricultural extension programs at Cornell as associate director of Cooperative Extension. A little more than a year later, she was promoted to the position of director of Cornell Extension with accompanying titles of associate dean in the College of Agriculture and Life Sciences and the College of Human Ecology. In this position, she now oversees 1,700 employees with an approximate annual system budget of $120,000,000.

Dillard's leadership as director has been transformational. Within the university, she has greatly strengthened the relationship with central university functions resulting in increased awareness of Cornell Cooperative Extension university-wide. She has become a part of central university decision making, is regularly invited to university trustee meetings, and is a part of trustee committees. Dillard has also engineered greatly improved relationships with stakeholder groups throughout New York State by regular involvement with representative commodity groups and agricultural agencies and councils. The implementation of a comprehensive involvement strategy to bring stakeholders to the decision making processes has focused program and resources on areas of greatest need.

Yet throughout her administrative rise, Dillard has remained a plant pathologist. Getting into the field to assess disease brings her back to her roots. Impossible as it seems, she finds time on a weekly basis to leave her Ithaca-based director's role and travel to Geneva where she maintains her department office and laboratory. Within the last year, she has studied the vulnerability of snap beans to soybean rust as well as drafted a Section 18 emergency exemption request for fungicides that control soybean rust on snap and dry beans in New York. She continues work on the long-range dispersal of maize rust and has identified a new russet disease on snap bean caused by *Plectosporium tabacinum*. Finally, she is involved with a team of researchers addressing a recent outbreak of virus diseases of snap beans.

Dillard has a deep regard for her chosen profession and her plant pathologist colleagues. She has served the Society as a member of various regional and national committees, section editor for *Fungicide and Nematicide Reports*, ad hoc reviewer for *Plant Disease* and *Phytopathology*, and councilor-at-large. She has also served on panels for the USDA/NRI programs and the National Research Council. Dillard is committed to insuring diversity within science, academe, and plant pathology, and has been actively involved in outreach to universities such as Spellman, Howard, and Southern. Dillard is a true ambassador representing the best qualities of a scientist and leader, whether her audience is a 4-H club, a national conference, or an assessment team in an underdeveloped county.

Dillard's many and valuable contributions span the field from research to extension to education. Her service to her department, her stakeholders, the Cooperative Extension Service, her college and university, and her professional society represents a truly remarkable career for anyone 20 years her senior.

Rose C. Gergerich

Rose Gergerich, born in Wausau, Wisconsin, grew up on a dairy farm with her ten siblings and parents who stressed the importance of education and hard work. She received a B.A. degree in education and an M.S. degree in botany from the University of Wisconsin-Milwaukee, and a Ph.D. degree in plant pathology from Michigan State University. She is currently a professor in the Department of Plant Pathology at the University of Arkansas.

Gergerich's research focuses in the area of etiology, epidemiology, and control of plant virus diseases with an emphasis on the virus–vector relationships of beetle- and nematode-transmitted viruses. She has maintained a comprehensive research program in both basic and applied virology. Her program serves two distinct objectives: (i) a basic scientific intellectual objective that allows for a theoretical understanding of how vectors transmit plant viruses, and (ii) a practical objective that suggests how to apply our understanding of viral disease development to plan efficient strategies for disease management. It is, in part, this duality of purpose that distinguishes Gergerich's research program. Gergerich is well recognized both nationally and internationally for her innovative research in plant virus transmission by beetle vectors. The most significant accomplishment in her basic research was the development of a theory to explain the specificity of virus transmission by leaf-feeding beetles. Her pioneering research in this area has led to an understanding of the role of ribonuclease in beetle regurgitant, as well as the function of virus particle translocation and viral infection of unwounded tissue as determinants in beetle transmission of viruses. In her study on the transmission of virus–nematode vectors, she developed and used an immunofluorescent labeling technique to identify the unique virus attachment sites for several viruses that are transmitted by nematodes. Using this technique, she was able to study virus attachment in populations of nematodes, and she demonstrated that the gain and loss of virus from attachment sites in the nematodes within a population parallels the increase and decrease, respectively, in the transmission efficiency of the nematode population.

Gergerich's most important accomplishments in applied research have been the determination of the incidence and spread of three economically important viral diseases in winter wheat and tomato in Arkansas. Information from her collaborative work with colleagues at the University of Arkansas has helped to establish control methods for reducing the incidence of two soilborne viruses in winter wheat in Arkansas and to identify sources of resistance to *Tomato spotted wilt virus* in tomato. Recently, the Arkansas blackberry production and nursery industries, as well as the internationally recognized blackberry breeding program at the University of Arkansas, have been threatened by the occurrence and spread of viral diseases of unknown etiology. In a collaborative effort with researchers at the USDA Horticultural Crops Research Lab, they have identified and partially characterized two new viruses in symptomatic blackberry cultivars and wild blackberry plants in Arkansas. A crinivirus, *Blackberry yellow vein-associated virus*, is widespread in cultivated blackberries in the United States. Gergerich was instrumental in developing guidelines for the Arkansas State Plant Board inspectors for the blackberry certification program, and this effort will have an impact on the management of the diseases in blackberry caused by these viruses.

Gergerich has characterized the reactions of selected plant introductions (PIs) of *Glycine canescens*, *G. falcata*, *G. latifolia*, *G. latrobeana*, *G. microphylla*, and *G. tomentella* to *Bean pod*

mottle virus (BPMV). She identified nine PIs resistant to this virus from these species. Presently, there are no known soybean cultivars resistant to BPMV. Efforts to identify resistance to CMV in cowpea have been unsuccessful, and Gergerich is currently working to produce CMV-resistant transgenic cowpeas through an RNA silencing mechanism. Gergerich has maintained a comprehensive and well-balanced applied and basic research program as reflected by support of her overall program from various extramural grants including the USDA/NRI Competitive Grants Program.

Gergerich's activities in teaching have improved the educational experience of students and have been recognized by students, colleagues, and peers. Gergerich teaches two graduate courses, Plant Virology and Science Professionalism, and has developed and taught an undergraduate course in general virology in the Department of Biological Science. Gergerich has served as a major advisor and/or co-major advisor to a dozen graduate students for both M.S. and Ph.D. degree candidates, and has served on 47 graduate committees of M.S. and Ph.D. students from different departments in the college and from other colleges on campus. In addition, she is actively involved in other instructional or advising activities. For example, she served as advisor for the Graduate Student Organization and coached students for the APS DeBary Bowl Competition, served as advisor for Adair undergraduate summer research internships, and served as chair of the plant science Ph.D. program. Gergerich is a demanding instructor who requires her students to put forth their absolute best efforts. Because of her commitment to instructional excellence and dedication to students, she has become a key advisor in the department known for its graduate advising and teaching.

Gergerich has served APS effectively in many capacities. She served as an associate editor for *Plant Disease* (1986–1989) and as senior editor (1990–1993) and editor-in-chief (2003–present) for APS PRESS (1990–1993). She served as secretary of APS (1995–1998) and was elected and served as councilor-at-large (1998–2001). She has been a member of numerous committees including the Virology Committee (1988–1992, chair in 1992), Women in Plant Pathology Committee (1992–1995), and Teaching Committee (2002–2005). Gergerich's determination to make plant pathological research useful to solving problems and furthering the science of plant pathology is second only to her compassion for others. While her self-imposed rigorous schedule often finds her in her office, lab, greenhouse, or fields long after others have left, Gergerich always has time to listen to the professional or personal problems of others. Her enthusiasm for her research and her concern and caring for her work and for the people with whom she works makes her a truly special person.

John R. Hartman

John R. Hartman was born in 1943 in Bellerose, NY, and was raised from an early age in Manitowoc, WI. His B.S. (biochemistry), M.S. (plant pathology), and Ph.D. (plant pathology with botany minor) degrees were all awarded by the University of Wisconsin-Madison, in 1966, 1970, and 1971, respectively. In 1971, Hartman was appointed assistant extension professor at the University of Kentucky, rising through the ranks to extension professor in 1982.

Hartman has extension responsibility for diseases of forest, greenhouse, landscape, and nursery plants, as well as for urban horticulture and fruit crops. In earlier years, he variously held responsibilities for corn, turfgrasses, and vegetables. For 30 years, he has served the department as extension coordinator, relieving the chair's shoulders of a considerable burden. His value to Kentucky has long been recognized, and he was awarded the Outstanding Extension Specialist Award in 1986. Hartman's insight, notable lack of ego, and good judgment have ensured that an exceptionally compatible relationship exists among the Kentucky plant pathology extension specialists, and that the whole is greater than the sum of its parts. In 1992, the USDA's Cooperative States Research Service Review Panel noted that the department's extension unit represented "one of the most cohesive and well delivered programs in the country." Hartman has been supervisor of the Plant Disease Diagnostic Laboratory (PDDL) since 1975, providing on-the-job training for four M.S.-level diagnosticians. The PDDL is a frequently hectic operation, particularly in the summer months, and processes some 3,000 to 4,000 specimens per year. Hartman has been, and remains, a leader in extension within and beyond the state for landscape plant health care, pesticide applicator training, food safety/quality, as well as tree fruit and small fruit pest management. For example, the Apple IPM Program, which involved three departments on campus and eight Midwest universities, has greatly benefited commercial apple growers, who were taught to scout their orchards and make rational spray decisions. Growers were also instructed with respect to apple scab models and were taught to run a computer fire blight prediction model. The value of this program was noted by the United States' Senate Committee on Agriculture, Nutrition, and Forestry Report on Pesticide Use Reduction Assessment, which stated the following: "In 1992–1993, approximately 65 apple growers, representing 25% of the Kentucky apple production adopted a pest predictive program to manage their orchards. Adopters were able to eliminate 1 fungicide and 3 insecticide applications in 1992 (compared to non-IPM blocks), and 3 fungicide and 4 insecticide applications in 1993. Based on typical application rates, this represents a reduction of approximately 5,200 lbs of active ingredients (3,000 lbs fungicides and 2,200 lbs insecticides), and an increase to profitability of $35,000." Hartman's extension publications are numerous. In five separate years, spanning 1988 to 2002, Hartman and colleagues won Outstanding Extension Publications Awards from the American Society for Horticultural Science and/or its Southern Division. Hartman is an accomplished and collaborative extension specialist.

Hartman has maintained an applied research program relevant to his commodity responsibilities, publishing his findings in journals such as *Phytopathology*, *Plant Disease*, *Plant Pathology*, *Journal of Arboriculture*, and *Journal of Environmental Horticulture*. Hartman and his collaborators have conducted research on bacterial leaf scorch, for which they identified new hosts of *Xylella fastidiosa*, as well as on apple scab, dogwood anthracnose and powdery mildew, Pierce's disease of grapes, tip blight of pine, and sudden oak death. Hartman's findings have advanced both basic understandings of plant disease and practical management. Hartman has gained funding for his research from numerous sources including the USDA, the International Society of Arboriculture (ISA), the Horticultural Research Foundation, the Kentucky Division of Forestry, and various commercial companies. Through sabbatical studies at the University of California-Davis, ADAS in England, and INRA in France, Hartman broadened the outlook of his extension plant pathology programs.

In a department with a long-standing and particular focus on basic research, Hartman has been a key to students keeping "one foot in the furrow" by introducing them to the diverse, practical aspects of plant pathology. Since 1976, Hartman has taught or co-taught PPA 640, Identification of Plant Diseases. Students are exposed to a wide variety of plant diseases and learn how to diagnose them through traditional and modern techniques. They also observe diseases and their effects first-hand through field trips and diagnostic laboratory practice, acquire the principles of diagnosis, learn of the broad spectrum of diseases occurring on

Kentucky crops, and come to understand the value of experience. Hartman has also presented countless invited lectures within and outside the department. Moreover, he has served on numerous graduate advisory committees for M.S. and doctoral candidates, in several instances as co-major professor.

Excluding public service, which falls within Hartman's extension domain, there are many ways in which he has used his professional expertise for the greater good. Hartman has served APS loyally. Preeminent among these activities was his conception and establishment of *Biological and Cultural Tests for Control of Plant Diseases* (*B & C Tests*), for which he was the first editor-in-chief from 1986 to 1988. Hartman has also served twice as an associate editor of *Plant Disease* (1982–1984, 2001–2003) as well as on several committees (diseases of ornamentals and turfgrasses, extension, public relations, and diseases of ornamentals). He has authored or co-authored chapters in the APS book entitled, *Diseases of Woody Ornamentals and Trees in Nurseries*. The ISA has also benefited from Hartman's expertise through his committee roles (publications, annual conference educational exhibits, education program, and international) as well as his membership in the Arboricultural Research and Education Academy and the Editorial Review Board of the *Journal of Arboriculture* (1986–1988, 1995–1997). In 1986, the ISA recognized Hartman with the Gold Leaf Award for Outstanding Arbor Day Activities. Hartman has reached a wide audience through his book publications. Particularly noteworthy is P. P. Pirone's *Tree Maintenance*, a standard in its field, and now substantially revised in its seventh edition, for which Hartman was the principal author.

Charles R. Howell

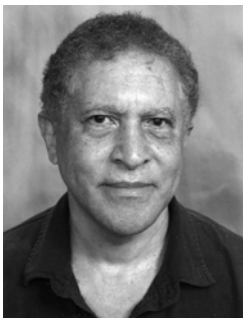
Charles R. Howell was born in Fort Worth, Texas, on December 26, 1935. He received his B.S. degree in biological sciences from California State Polytechnic College, Pomona, in 1962. He received his Ph.D. degree in plant pathology from Washington State University in 1967, having conducted his dissertation research on the biochemistry of resistance to onion smut with Ruben Duran and Shirl Graham. Howell was then employed by the USDA to work on Verticillium wilt of cotton at the Texas A&M Experiment Station in Lubbock, Texas. After 4 years, he moved to the Cotton Pathology Research Unit in College Station, Texas, where he remained until his retirement in January 2006. Howell continued his work on Verticillium wilt until 1977, during which time he discovered that mutants of *V. dahliae* deficient for pectinase activity were still pathogenic to the cotton host, and that production of catechin and tannins in cotton leaves was related to their resistance to the pathogen. He then initiated a research program on biological control of cotton seedling diseases, with an emphasis on the mechanisms employed by biocontrol agents to suppress soilborne pathogens.

Howell has made numerous landmark discoveries in the field of biological control of plant disease, with an initial focus on rhizosphere bacteria for suppression of seedling diseases of cotton. In the late 1970s, he isolated *Pseudomonas fluorescens* Pf-5, an effective biological control agent of damping-off diseases caused by *Pythium ultimum* and *Rhizoctonia solani*. With his colleague Robert Stipanovic, he published two classic papers in *Phytopathology* demonstrating that Pf-5 produces the antibiotics pyrrolnitrin and pyoluteorin, which suppress disease when applied to seed surfaces. With agrocin 84, whose structure was published by another group during the same year, pyrrolnitrin and pyoluteorin were the first structurally characterized antibiotics with a demonstrated role in biological control of plant disease. Before that time, antibiotics were considered to be too unstable to play an important role in soil ecology, so these manuscripts ushered in a new era focusing on antibiosis as a central mechanism in biological control. Strain Pf-5 has since been used as a benchmark for other strains by biological control researchers worldwide, and it has served as a model organism for molecular and ecological studies of biological control. It was the first biological control agent for plant disease whose complete genome was sequenced. Howell's subsequent work with pseudomonads, done in collaboration with CIBA-GEIGY Inc. (now Syngenta), led to the patenting of several strains for seedling disease control, and to the production of a pyrrolnitrin analog (Maxim) as a seed and foliar fungicide. Maxim provides the first example in which a natural product with a demonstrated role in biological control has been developed as a highly successful fungicide for management of plant disease. In addition to his work with *Pseudomonas* spp., Howell also discovered the novel mechanism of ammonia production for suppression of Pythium damping-off of cotton by the biological control bacterium *Enterobacter cloacae.*

Howell also discovered several secondary metabolites produced by fungal biological control agents and determined their roles in the suppression of seedling diseases. This research began with the isolation and characterization of a mycoparasite of *R. solani* that proved to be *Trichoderma* (*Gliocladium*) *virens*. From cultures of *T. virens*, he and a colleague isolated the novel antifungal compound gliovirin, determined its structure, and demonstrated that it is toxic to phycomycetes. He demonstrated that strains of *T. virens* could be separated into two distinct groups on the basis of their antibiotic production: "Q" strains produce the antibiotic gliotoxin, whereas "P' strains produce gliovirin. Howell and a colleague also isolated and characterized the phytotoxin viridiol that is produced by *T. virens* and demonstrated that viridiol could be used effectively to control weeds. He also found that viridiol production was influenced by the substrate on which the fungus was grown and that its production could be suppressed by the addition of sterol inhibitors to the growth medium. Howell was one of the first scientists to derive mutants of fungal biocontrol agents and employ them in experiments to determine the role of compounds such as gliovirin in biological control. In later studies, Howell demonstrated that the principal mechanism in the control of *R. solani*-incited seedling disease of cotton was the induction of terpenoid phytoalexin synthesis in the developing root system by *T. virens.* With a colleague, he isolated and characterized the protein produced by *T. virens* that induces phytoalexin production. In studies on the causes and biological control of preemergence seedling disease of cotton, Howell discovered that seed of susceptible cotton cultivars released a compound to the spermosphere during germination that stimulated pathogen propagules to germinate and infect. He also found that *Trichoderma* spp. controlled this disease by metabolizing the stimulatory compound before it reached the pathogens. Howell also discovered that one of the primary inciters of preemergence damping-off of cotton seedlings is *Rhizopus oryzae*, a fungus not previously known as a soilborne pathogen of cotton, and one that is not sensitive to the fungicides normally used to control this form of the disease. Howell's reputation as an expert in the field of biological control is evidenced by the fact that he has conducted much collaborative research work with scientists in industry and academia and by the review articles, book chapters, and popular articles that he has been asked to write on the subject. He is also the author or coauthor of four patents relating to biological control.

Howell is a member of the graduate faculty of the Department of Plant Pathology and Microbiology at Texas A&M University, where he serves on the thesis committees of M.S. and Ph.D. students. He has been an active member of APS since 1963 and of the Cotton Disease Council since 1966, where he has served as secretary, vice chair, and chair of the CDC. Howell is currently an associate editor of *Phytopathology*.

Ben E. Lockhart



Professor Benham E. L. Lockhart was born in Kingstown, St. Vincent, the West Indies, in 1945. He earned his B.Sc. degree in tropical agriculture at the University of the West Indies in Trinidad in 1965 and his Ph.D. degree in plant pathology from the University of California at Riverside in 1969. Between 1969 and 1971, he was a post-doctoral fellow with M. K. Brakke at the University of Nebraska and with D. E. Schlegel at the University of California, Berkeley. He has been a faculty member of the Department of Plant Pathology at the University of Minnesota since 1971, becoming professor in 1986.

In 1971, Lockhart accepted an assignment to the fledging Institut Agronomique et Veterinaire at Hassan II University in Rabat, Morocco. Lockhart served in Morocco for a total of 12 years, from 1971 through 1976 and from 1981 through 1986. During his 12 years, he developed two modern laboratories for plant virus research. One was at the main campus in Rabat and one in Agadir at the center of the vegetable growing area in southern Morocco. From these laboratories, Lockhart and his students and collaborators identified and characterized many of the most serious plant viruses affecting Moroccan agriculture. He designed his teaching and research in an integrated fashion to meet the demands of education in a developing nation. He adapted his life style to be compatible with the customs of Morocco. A native English speaker, he became proficient in several languages. He taught his students in French and increased his effectiveness by becoming proficient in written and classical Arabic and Spanish.

In Morocco, Professor Lockhart designed research and teaching efforts for maximum effectiveness in a developing nation. To enhance hands on, practical and scientific education for Moroccan students, he initiated a cooperative effort with H. U. Fisher of Germany designed to identify the most serious virus diseases of Moroccan vegetable crops. Each undergraduate student who studied with Professor Lockhart researched a virus disease of an important Moroccan vegetable or fruit crop. Professor Lockhart became these students' advisor and mentor. He arranged for many of them to attend universities in Europe and the United States for advanced graduate education. Advanced students returned to Morocco, did more detailed research on local virus problems, and received their Ph.D. degree under Lockhart's supervision. In 1975, King Hassan II visited Professor Lockhart and his students at his plant virology laboratory at Hassan II University. Today, plant virology research and teaching at Hassan II University is conducted by Moroccan nationals who obtained their Ph.D. degrees under Professor Lockhart's direction. In 1993, the Moroccan ambassador to the United States traveled to Minnesota to present Professor Lockhart with a gold medallion to honor his dedicated service to Moroccan science and agriculture. In 1996, Lockhart was given the APS Professional Service Award for his international work.

At Minnesota, Lockhart began an extensive research program into a little known group of nonenveloped bacilliform plant viruses transmitted by mealybugs and through seed. He and his students were the first to determine that the genomes of these viruses consisted of circular, double-stranded (ds) DNA. He, along with his Minnesota collaborator Dr. Olszewski and their students, was the first to obtain full-length genomic sequences of several of these viruses, including *Commelina yellow mottle virus* (CoYMV). Professor Lockhart named his new group the "Badnavirus" group and proposed CoYMV as its type member. The genus *Badnavirus* is now accepted by the International Committee for Taxonomy of Viruses.

Intensive research by Lockhart and his collaborators and other laboratories into the molecular genetics of the badnaviruses demonstrated their plant pararetrovirus nature. They showed that CoYMV replicated its genome in a manner similar to the caulimoviruses. Their research revealed a viral-encoded reverse transcriptase was responsible for replication of the dsDNA viral genome via an RNA intermediary. Most recently, he and colleagues discovered that badnavirus sequences that are integrated into the plant chromosomal DNA can cause whole plant infections. This was a very important discovery from both the basic science and the plant pathology perspective. Infections that are caused by the integrated *Banana streak virus* (BSV) genome are problematic for several different banana breeding programs. Following the BSV work, he discovered that integrated *Tobacco vein clearing virus* sequences can also cause infection. This work has also led to the hypothesis that genetic, physiological, and environmental factors must be involved in the activation of integrated sequences. This hypothesis stems in part from epidemiological studies performed by Lockhart. Lockhart's discovery of the badnaviruses and the *de novo* disease expression resulting from recombination of the pararetroviral sequences that were integrated into the host genome to form an episomal virus are original research discoveries of great significance to virology and to plant pathology.

Because of his expertise in plant virology and international education and agriculture, Professor Lockhart has been in great demand for international consulting and advising. In 1977, he was a member of the ICPP team for planning integrated pest management training in Tunisia. In 1978, he served as a consultant to the U.S. National Academy of Science's Board for Science and Technology for International Development in Cameroon, and returned to that area of Africa as an AID consultant in 1979. Between 1979 and 1990, he served as a consultant or advisor to USAID, the United Nations, and various other organizations on international development programs in Bolivia (1979 and 1986), Cuba (1979), Zaire (1980 and 1989), Tunisia (1982), St. Vincent (1986), Rwanda, Kenya, Nigeria, Togo, Cote d'Ivoire, Thailand, and Mauritius (1990). In recent years, his finding that commercial sugarcane and banana are almost uniformly infected with badnaviruses has led his active advising and consulting in Barbados (1992), Cuba (1992), Brazil and Ghana (1993), Australia (1994), and Nigeria (1995). In 1997, he attended the World Bank Planning Conference in Guadeloupe to coordinate the research activities related to the control of diseases and pests of banana and plantain.

Ulrich Melcher

Born in London, England, Ulrich Melcher grew up in New York City and Westport, Connecticut. Melcher obtained his B.S. degree in biochemistry from the University of Chicago, and his Ph.D. degree in biochemistry in 1970 from Michigan State University. He was a NATO post-doctoral scientist in bacterial genetics at Aarhus University's Molecular Biology Laboratory, and then in molecular immunology at New York University and the University of Texas Southwestern Medical School. Melcher began working with plant viruses at Oklahoma State University, and later was awarded a Fulbright sabbatical in Strasbourg, France. Currently, Melcher is R. J. Sirny Professor of Agricultural Biochemistry in the Department of Biochemistry and Molecular Biology at Oklahoma State University (OSU) and adjunct professor in the Department of Microbiology and Molecular Genetics. His scientific accomplishments span fields from biophysics and bioinformatics

through bacteriology and immunology to brewing and phytopathology. As a result, he has helped author close to 100 scientific papers in over 50 diverse journals. His current interests are in plant virus biodiversity and ecology, and bacterial pathogens of plants.

Melcher began research in plant virology through a desire to develop *Cauliflower mosaic virus* (CaMV) into a vector for gene transfer to plants. His laboratory was one of the first to identify the CaMV gene (gene II) for aphid acquisition, and showed that gene II could be mutated and the recombinant CaMV could still be mechanically inoculated to plants. Studies by his group on the mechanisms of CaMV DNA recombination revealed the difficulties of using CaMV as a vector. Skeleton hybridization, a Melcher lab technique that inspired others to develop tissue printing, has, in others' hands, revealed much about virus spread through plants. Further studies focused on recombination in plant viruses and other aspects of virus evolution. His expertise in sequence analysis allowed him to predict which genes for viruses of many different genera encoded the proteins necessary for virus cell-to-cell movement in plants. He has helped many colleagues with technical aspects of sequence alignment and phylogenetic analysis. Melcher and colleagues discovered, characterized, and popularized *Turnip vein-clearing virus* (TVCV), an *Arabidopsis*-infecting member of the genus *Tobamovirus* suited for molecular genetic investigations. Since its discovery, TVCV has become a model virus and has been used by others to identify host genes for intercellular movement of the viral infection and cadmium induced blockage of viral movement in plants. Melcher and his lab set up, and Melcher curates, VirOligo, a database of oligonucleotides used in virus detection. In recent years, Melcher's interests have shifted to estimating the biodiversity of plant viruses and developing pan-virus detection assays.

Melcher is an excellent collaborator. An early collaboration with Margaret Essenberg resulted in the demonstration that the cotton phytoalexin, dihydroxycadalene, is active against bacteria but would also inactivate CaMV. Collaborative research with Jacqueline Fletcher led to demonstrating phage-mediated immunity in spiroplasmas through integration of phage DNA in the host chromosome and in identification of phage genomes as modified insertion sequences. Recent collaborative efforts directed at the molecular mechanisms of transmission of the spiroplasma by leafhopper vectors led to identifying and characterizing several spiroplasma-encoded proteins that may serve as adhesins. Interestingly, one of these appears to have a phage origin. Melcher also works with Oklahoma and Texas plant pathologists in understanding a new disease, cucurbit yellow vine. He provided the molecular expertise that guided the characterization of the causal organism as a strain of *Serratia marcescens* and designed diagnostic PCR primers for it and other cucurbit pathogens.

In addition to his own research activities, Melcher has taken a leadership role in Oklahoma's NSF-EPSCoR project, serving as coordinator for the two most recent biological theme areas. Currently, he serves on the Steering Committee of the state's NIH-IDeA Network for Biomedical Research Excellence (INBRE) Program. He has been president of OSU's chapter of Sigma Xi, received its Chapter Lectureship Award, and is its webmaster. Webmastering duties are also performed for the Virology Committee of The American Phytopathological Society (APS). For APS, he also has served as associate editor of *Phytopathology*, organizer of Virus Evolution Symposia, and member of the Microbial Forensics Interest Group. He has served as president and treasurer of OSU's chapter of the American Association of University Professors and led the establishment of a faculty council in his college. For the Oklahoma Academy of Science, he has twice served as chair of the Biochemistry and Biophysics section, and in January 2006, he entered the presidential lineage of the academy. He teaches molecular biology courses using his molecular genetics webtext, a designated "Cool Site," and mentors graduate students. The OSU Graduate and Professional Student Association chose him as one of three finalists for the "best graduate student mentor."

In summary, Melcher is an internationally recognized pioneer and contributor in investigations of the diversity and molecular evolution of plant viruses. He also is recognized worldwide as an authority on the molecular interactions of viruses and bacteria with plant hosts and insect vectors. His research program has provided a framework for the outstanding mentoring of young scientists at the undergraduate, graduate, and post-doctoral levels, and he is well known as an excellent collaborator in both research and teaching.

Ravi Singh

Ravi P. Singh was born on June 24, 1957, in Varanasi, India. He graduated from Banaras Hindu University in 1977 with distinction and then in 1979 completed his M.S. degree. He received his Ph.D. degree from the University of Sydney in 1984. His professional carrier initiated in 1983 as a post-doctoral fellow at the International Maize and Wheat Improvement Center (CIMMYT) in Mexico where he became Distinguished Scientist in 2005. Currently, he is head of bread wheat improvement for intensive agroecosystems. He is fellow of the American Society of Agronomy, Crop Science Society of America, and National Academy of Agricultural Sciences (India) and recipient of the prestigious Outstanding CGIAR Scientist Award.

Singh is known worldwide for his contributions in controlling wheat rust diseases through the use of durable genetic resistance. His research has highlighted that globally effective, durable resistance to leaf (brown) and yellow (stripe) rusts in wheat involves interactions of slow rusting genes that have small to intermediate but additive effects and the accumulation of four or five such genes results in a level of resistance comparable to immunity. His group has identified 10 diverse slow rusting genes through traditional genetics and molecular mapping and discovered that some slow rusting genes confer partial resistance to multiple diseases such as genes *Lr34-Yr18* and *Lr46-Yr29* for leaf rust and yellow rust, respectively. He also reported linkage/pleiotropism of *Lr34-Yr18* with the *Barley yellow dwarf virus* tolerance gene *Bdv1* and leaf tip necrosis (a morphological marker). Recent work with co-workers has further indicated that gene *Lr34* also confers partial resistance to spot blotch and powdery mildew diseases. Together with co-workers, their research has led to the identification and designation of 12 genes in wheat: *Sr8b* for stem rust resistance; *Lr31* and *Lr46* for leaf rust resistance; *Yr18*, *Yr27*, *Yr28*, *Yr29*, *Yr30*, and *Yr31* for yellow rust resistance; *Bdv1* for *Barley yellow dwarf virus* tolerance; *SuLr23* for suppression of leaf rust resistance; and *Ltn* for leaf tip necrosis. More recently, they have identified five currently effective genes in durum wheat that confer resistance to leaf rust and durum germ plasm with slow rusting resistance.

Singh not only elucidated the genetic basis of durable rust resistance but also simultaneously developed some of the highest yielding CIMMYT spring wheat germ plasm that contains high levels of durable, adult plant resistance to both leaf and yellow rusts. Such germ plasm has clearly shown that slow rusting genes and high yield potential can be selected simultaneously; and hence, presence of such genes does not have significant cost to plant. These lines with near-immune levels of resistance to both leaf and stripe rusts are at different stages of testing for candidates for release in various developing countries of Asia, Africa, and America and are also being used by several breeding programs

including those in the United States and Australia. Previously, he contributed to the development of wheat cultivars that had two to three slow rusting minor genes for leaf rust resistance. Economic impact analysis has shown that such cultivars currently occupy more than 26 million hectare in various developing countries and have contributed over 5 billion US$ through yield savings in epidemic years.

Singh also has contributed significantly in enhancing the knowledge of diversity in wheat rusts and evolution/selection of new races significant to wheat production in developing countries. He established and coordinated Global Rust Monitoring Network that involved various developing countries' programs, Cereal Rust (now Disease) Laboratory in the United States and IPO in the Netherlands. Rust samples, collected in various developing countries between 1886 to 1995, were characterized in either the United States (leaf and stem rust) or IPO (stripe rust) and then stored for future use. This network added very significant information on the understanding of the population diversity in different developing country regions and also demonstrated the migration path of *Puccinia striiformis* from Eastern African highlands to South Asia. To understand the variability in the yellow rust pathogen, *P. striiformis*, and to promote the use of a uniform set of differential lines worldwide, through a collaborative project with Sydney University, they developed and distributed near-isogenic lines in Avocet background for 19 yellow rust resistance genes and continue to do so for most of the remaining known resistance genes. Singh continues to coordinate the global rust-monitoring network, though in a different form, where empowered and well-trained national program scientists coordinate it regionally.

Singh currently leads an ambitious wheat-improvement project at CIMMYT that aims at replacing by 2010 over 60% of the rust-prone developing countries spring wheat area with high-yielding, durable rust-resistant cultivars, which currently occupy about 25% of the area. He has been actively engaged for the last 22 years in educating and training over 400 young scientists from several developing countries of Asia, Africa, and Latin America who obtained their diploma in wheat improvement at CIMMYT. He taught courses over a wide array of disciplines, such as host–pathogen interaction, resistance genetics, breeding for disease resistance, and management of rust diseases of wheat. These courses, which combine theoretical and practical aspects, have led to the better use of disease management strategies by a number of scientists in their respective countries. He also directed the training of 15 senior scientists from India, Pakistan, Bangladesh, China, Iran, Turkey, Kazakhstan, Argentina, Mexico, Ethiopia, and Uganda who are currently leading researchers. He has directed graduate research programs for four M.S. and six Ph.D. students and currently serves on the advisory committees of four Ph.D. students in the United States, Sweden, and China. He served as an associate editor of *Phytopathology* from 1992 to 1994 and as a member of the Host Resistance Committee from 1996 to 1999.

James L. Starr

James L. Starr was born in Dayton, Ohio. He received a B.S. degree in plant pathology from Ohio State University in 1971 and completed an M.S. degree the following year. His research studies in plant nematology began at Cornell University with William F. Mai. After receiving a Ph.D. in 1976, Starr joined the International *Meloidogyne* Project at North Carolina State University as a post-doctoral associate with Joseph N. Sasser. This included an 8-month appointment as a visiting nematologist at ICRISAT in India where he developed an international perspective on plant disease management. He later worked at the North Carolina Department of Agriculture Nematode Advisory Laboratory. In 1981, Starr was appointed associate professor in the Department of Plant Pathology and Microbiology at Texas A&M University where he now holds the rank of professor.

Starr is internationally recognized for his leadership in plant nematology. Studies of the ecology and epidemiology of economically important nematodes have transformed management strategies for peanut and cotton crops in Texas, and promise to transform the worldwide peanut and cotton industries. Specifically, he documented the frequency distributions of *Meloidogyne* species and developed models of winter survival by comparing the relative role of eggs and second-stage juveniles. By investigating the relationship between nematode number and yield loss, he determined damage functions for *M. incognita* and *M. arenaria* on cotton and peanut, respectively. He also determined the complex effects of interactions among nematode infection, fungal disease complexes, and host–plant resistance on these damage functions. Recently, Starr and a long-time collaborator and peanut geneticist, Charles Simpson, introgressed resistance to *M. arenaria* and *M. javanica* from wild *Arachis* species into cultivated peanut. Their release of Coan represents the first nematode-resistant peanut cultivar. Starr was the first to use a marker-assisted selection system for peanuts, and is using this technology to incorporate nematode resistance into lines with *Tomato spotted wilt virus* and Sclerotinia blight resistance. He also developed the first genetic map of peanut in collaboration with scientists at Texas A&M and the University of Georgia. The genetic map, breeding strategies, and resistance markers are also being used by Starr to produce disease resistance peanuts with a high ratio of oleic to linoleic acid, which is nutritionally beneficial to human health and increases the shelf-life of peanuts.

Starr also has extensive collaborations to develop germ plasm lines with resistance to cotton root-knot nematode, and is currently working to introgress resistance to the reniform nematode from *Gossypium barbadense* into cultivated cotton that has extant resistant to *M. incognita*.

His research focus is on the biology, epidemiology, and management of root-knot nematodes, especially on cotton and peanut, with a goal of furthering our understanding of the cell biology of the root-knot/host interactions. Starr has characterized a complex of proteins in esophageal gland secretions (nematode spit) of *Meloidogyne* species and quantified the multinucleate nature of nematode-induced giant cells in host plants. These polyploid nurse cells increase in gene copy number several hundred-fold. Starr showed that a reduction of nuclei of greater than 70% in giant cells affected a reduction in development of the nematode parasite, suggesting the potential for genetic engineering as an additional form of an IPM-based control strategy. To characterize the relationship between gene copy number in giant cells and nematode development, Starr pioneered the use of laser-capture microdissection coupled with real-time PCR to study gene expression in the giant cells. Starr discovered that tissue sample volume is a more appropriate reference for gene expression than comparison to house-keeping genes, whose expression is likely to be greatly altered in giant cells.

Starr's basic research has drawn the attention of plant pathologists, nematologists, and plant breeders, revealing his unique strength in bringing modern laboratory practices to practical applications for crop improvement. Another measure of his success is funding by USDA-NRI, USDA-IPM, and US-AID as well as industry and commodity grants. Starr has authored more than 100 publications, including 70 peer-reviewed journal articles. He recently co-edited two books entitled, "*Plant Resistance to Parasitic Nematodes*" and "*A Colour Handbook of Nematode Diseases*" for the nematology community.

Starr has a prolific record of training and mentoring more than 20 graduate students who have developed successful careers

in industry, universities, and government agencies. Starr is committed to graduate student success and scholarship, including written articles and seminars on ethics and professionalism in science. At Texas A&M, he has played a defining role in teaching several key graduate courses on the application of the science of plant pathology in addressing plant disease management. Currently, he teaches or co-teaches Advanced Plant Pathology, Diseases of Field Crops, Host-Plant Resistance, and a new online course entitled Plant Disease Management. Starr is an effective and popular instructor who emphasizes principles important to plant pathology and has the unusual ability to teach and support a research program encompassing his interests from molecular plant–microbe interactions to applied plant pathology.

As expected of a scientist with an outstanding record of contributions to plant pathology, Starr has had extensive involvement in The American Phytopathological Society (APS) and the Society of Nematologists (SON). He served as president of SON from 1996 to 1997. He has worked to advance the science of nematology by serving on several editorial boards, including senior editor for APS PRESS, a founding senior editor of the APS online journal *Plant Health Progress*, and the current editor-in-chief of the *Journal of Nematology*. As vice-chair of the Nathan A. Cobb Foundation, Starr was instrumental in completing a fundraising goal of $100,000 for the SON student travel awards. He has served on numerous grant panels as an authority on plant nematology and integrated pest management.

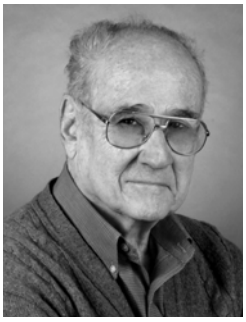
Starr is a respected and distinguished plant nematologist and, accordingly, he was elected as fellow of the Society of Nematologists in 2003. He also was honored for his contributions to the peanut industry where he received the American Peanut Research and Education Society "Bailey Award" on two occasions for outstanding research, and was a recipient of the American Peanut Council's Research and Education Award in 2001.

Starr is recognized for his scientific contributions and leadership as a plant pathologist. He has a distinguished record of professional service, which speaks to his leadership role in promoting the science of plant nematology. His studies of the nature and genetics of crop resistance to nematode diseases are recognized as an important model for other plant pathologists studying soilborne pathogens of field crops.

Award of Distinction

This award, the highest honor the Society can bestow, is presented on rare occasions to persons who have made truly exceptional contributions to plant pathology.

Milton Zaitlin



Milton Zaitlin was born in Mt. Vernon, New York, on April 2, 1927. In 1949, he obtained his B.S. degree in plant pathology from UC Berkeley. After conducting research on the use of plants as a bioassay for smog formation in 1949 to 1950 at the Caltech, he began graduate study at UCLA under Samuel G. Wildman in botanical sciences. There he developed a serological virus detection system that was used commercially in Hawaii for several years. He was awarded his Ph.D. degree in 1954.

From 1954 through 1958, Zaitlin was a research officer at the Microbiology Section, Division of Plant Industry, CSIRO, Canberra. At this time, plant virology was concerned mostly with the identification of new viruses and the characterization of the virus particles. However, Zaitlin directed his attention to virus replication and the investigation of virus mutants. His moved as a postdoctoral researcher to the Department of Horticulture, University of Missouri, Columbia, in 1958. In 1960, he accepted a position in the Department of Agricultural Biochemistry at the University of Arizona, Tucson, where he rose to the rank of full professor. He moved to Cornell University, Ithaca, Department of Plant Pathology, in 1973 and became professor emeritus in 1997.

Professor Zaitlin was both a Fulbright Scholar and a Guggenheim Fellow during his sabbatical leave in 1966 to 1967 with Paul Whitfeld at the Division of Plant Industry, CSIRO, Canberra. He was visiting scientist at the John Innes Institute, Norwich, in 1986 and visiting research scientist, Department of Biochemistry and Biophysics, UC Davis, in 1979 to 1980. Professor Zaitlin was elected a fellow of AAAS in 1969 and a fellow of APS in 1978. His refereed research publications cover over a 50-year span, from 1951 to 2000.

Although Professor Zaitlin emphasized virus replication, he nonetheless made important contributions to the detection, purification, and analysis of virions and viroids and to understanding virion function. He often employed simple and direct approaches to test hypotheses. He demonstrated that TMV uncoating and gene expression occurred in animal cells, thereby providing a strong argument against hypotheses for uncoating that would require the plant cell wall. Similarly, he isolated and incubated protoplasts from inoculated leaves to show that certain "subliminal" infections are in fact infections entirely restricted to the few cells infected at the time of inoculation, a conclusion that could not be drawn from direct examination of the leaves. He was among the first to realize the importance of cell-to-cell movement as a point of vulnerability exploited by natural resistance and made significant contributions to our understanding of long-distance movement.

Professor Zaitlin is well known for his studies on virus strains and mutants, mixtures thereof, defective viruses and their phenotypes. His work revealed that functional coat protein was not essential for infection or induction of symptoms.

He devoted considerable effort to devising plant single-cell systems as virus hosts. After developing tools for evaluating the accumulation of specific virus proteins and RNA in virus-infected cells, Professor Zaitlin published an extensive series of papers on virus RNA replication and others on TMV genome organization and gene expression. Before Professor Zaitlin's 1972 paper, no TMV protein other than coat protein had been demonstrated. Later, careful peptide mapping revealed that a high molecular weight protein observed by him was indeed, as he had postulated, a TMV-specified replicase protein. Using a variety of clever hybridization and other techniques, Professor Zaitlin was able to elucidate the genetic map of TMV 6 years before the nucleotide sequence of the TMV genome was available.

Professor Zaitlin has a long-standing interest in plant resistance to viruses. When plant transformation technology became available, he and his colleagues transformed tobacco with various

wild type and mutant versions of virus replicase genes, creating strong resistance that in at least some instances affected both replication and virus movement and likely did not rely on gene silencing.

Other interests include the relationship between virus infection of chloroplasts and chloroplast function. Professor Zaitlin also contributed substantially to our understanding of the nature of viroids and of the induction of symptoms by satellite RNAs. A barely noticed minor band on a gel stimulated Professor Zaitlin to discover the phenomenon of ubiquination of virus coat proteins.

Professor Zaitlin is the author of more than 30 review articles, many of which influenced directly or indirectly the development of plant virology. Professor David Baulcombe of the Sainsbury Laboratory stated, "his Annual Review with Roger Hull was a key text for me when I was entering the virology field."

Professor Zaitlin was committed to good teaching based on careful preparation and organization. His classroom and other lectures were characterized by clarity and precise expression in a pleasant and friendly atmosphere that never neglected critical thinking. He was an outstanding mentor to the many graduate students and post-doctoral associates. Roger Beachy, president of the Danforth Plant Science Center, states the following. "Milt was perhaps the most influential mentor in my career in science in general, and in plant virology in particular. His willingness to encourage, critique, and advise was part of a collegial relationship that fostered confidence and innovation while demanding critical thinking…"

Professor Zaitlin advanced his profession by serving two terms as associate editor of *Virology* (1966–1971; 1982–1984) and as editor of *Virology* for all plant virus submissions (1972–1981). He was senior editor for *Virology of Molecular Plant-Microbe Interactions* from 1987 to 1990. He was a member of the group that formed the American Society for Virology in 1982. Professor Zaitlin was the associate director of the Cornell Biotechnology Program (New York State Center for Advanced Technology) from 1983–1990 and was director from 1990 to 1991. He is widely recognized for his success in obtaining support for biotechnology research, facilitating communication among biotechnology researchers, and informing the public on biotechnology issues.

Professor Emeritus Milton Zaitlin is recognized as a very influential pioneer of plant virology who is also a valued mentor and a master of university instruction in the plant sciences.

Excellence in Extension

This award recognizes an APS member for excellence in extension plant pathology.

Marcia P. McMullen

Marcia P. McMullen was born in Omaha, Nebraska. She received her B.S. degree in botany, M.S. degree in plant pathology from Iowa State University, and Ph.D. degree in plant pathology from North Dakota State University. In 1984, she joined the faculty in the Department of Plant Pathology at North Dakota State University as an assistant professor with responsibility for cereal disease extension. She was promoted to associate professor in 1990 and professor in 1996. In addition to responsibilities for cereal disease extension, she also is coordinator for IPM education. Her current appointment is 95% extension and 5% teaching.

McMullen has developed a highly respected outreach program on the management of small grain diseases. Her outreach emphasizes use of IPM practices for disease control. She also coordinates disease surveys and evaluates efficacy of fungicides and biological agents for small grain disease management. She has provided disease management outreach on many diseases, including wheat streak mosaic, root rots, common leaf diseases, and Fusarium head blight (FHB or scab).

McMullen focused on FHB research and outreach beginning in 1993, when a devastating epidemic caused estimated losses of $1 billion in North Dakota, South Dakota, Minnesota, and Manitoba. She became known as a "go-to" person with expertise in FHB management. McMullen worked with elevators, commodity organizations, grain buyers, and representatives of the FDA to address concerns about wheat quality, efforts that helped calm a nervous grain industry. She worked with animal scientists and veterinarians to provide information on vomitoxin risks, including coauthoring a publication titled *Dealing with Scabby Grain and Vomitoxin*. She was co-organizer of Regional FHB Forums in 1993 and 1994 and an active participant in subsequent regional and national FHB forums, which included initiating new FDA guidelines for vomitoxin. Her collaboration with research pathologists and agronomists helped identify wheat varieties less susceptible to FHB, information that was used in her outreach programs. She established fungicide trials to identify the most effective products to reduce FHB and vomitoxin (deoxynivalenol or DON). She found some products managed FHB, but not vomitoxin, while other products managed both the disease and the toxin. She coordinated regional and national uniform FHB fungicide/biocontrol trials through 2000, and subsequently has continued participating in this effort of the U.S. Wheat and Barley Scab Initiative. She wrote eight special exemption documents submitted to EPA for fungicides for FHB management. She collaborated with agricultural engineers on improving fungicide application technology.

McMullen's research and outreach provided notable economic benefits in North Dakota, the Nation's largest producer of spring wheat, durum wheat, and barley with 6 to 8, 2 to 3, and 1.5 to 3 million acres per year, respectively. Following intensive outreach about FHB-tolerant cultivars that had better yields and test weights and lower vomitoxin, growers responded by increasing their acreage of the most tolerant cultivars. Over the 6-year period from 1994 to 1999, planting of more FHB-tolerant cultivars resulted in an estimated increased income of $11.2 million per year for North Dakota producers. When NDSU released an FHB-resistant spring wheat cultivar in 2000, extension information encouraged use, and by 2003 it was grown on 37% of 6 million acres. In addition, improved availability of efficacious fungicides plus adoption of better application methods resulted in 20% yield increases for growers using and needing fungicides, or a total of about $20 million net return per year in North Dakota. The combination of tolerant cultivars and appropriate use of efficacious fungicides resulted in improved income to North Dakota growers of over $30 million per year since 1994.

McMullen's testimony before the North Dakota legislature and before Congressional representatives and senators helped gain support for extension and research funding and receipt of disaster payments for North Dakota producers. She also provided information on FHB losses and management to the National Association of Wheat Growers, the U.S. Durum Growers, and to several APS and CPS regional and national symposia.

McMullen developed a website with "real-time" pest survey data and management information for five major North Dakota crops. She developed a Crop Scout School in 1984 which continues today, with annual attendance of 125 to 150, or approximately 2,500 to 3,000 total attendees. She was co-coordinator of the Advanced Crop Advisors Workshop from 1985 to 1992 and continues as a member of the coordinating committee.

McMullen has received many awards and honors for her outreach and service, including the Distinguished Service Award from the North Central Division of APS in 2005. She received the Agriculture Woman of the Year Award from the Sigma Alpha Agricultural Sorority and the State Meritorious Service Award from the North Dakota Epsilon Sigma Phi Extension Fraternity in 2004. She was part of a team that received an excellence award for educational materials from the American Society of Agronomy in 2003. In 2002, she received the Non-Farmer Award from the Manitoba - North Dakota Zero Till Farmers Association. In 2000, the North Dakota Grain Growers Association honored her for outstanding service to the wheat and barley industries of North Dakota, and she received the Communicator of the Year Award from the NDSU Agricultural Communication Department. She was honored in 1994 by the National Association of Wheat Growers with their Excellence in Extension Award, and in 1993, she received the People Who Make a Difference Award from the Grand Forks (North Dakota) Herald newspaper.

McMullen currently is feature editor for *Plant Disease* and on the Executive Committee of the U.S. Wheat and Barley Scab Initiative. She also has served APS as secretary-treasurer of the North Central Division from 1997 to 1999, chaired the IPM committee, and has been a member of the Extension Committee. She currently serves on the North Dakota State University College of Agriculture's Promotion, Tenure and Evaluation Committee.

North Dakota's recently retired extension director, Sharon Anderson, strongly supported McMullen's nomination. "Her work is well known across the region and the nation. She is truly engaged in her work and finds all the ways possible to make a difference, especially for the people of North Dakota."

Excellence in Industry Award

This award recognizes outstanding contributions to plant pathology by APS members whose primary employment involves work outside the university and federal realms either for profit or nonprofit.

Gregory L. Lamka

Gregory Lamka has been quality supply technology manager in the Supply Management Department of Pioneer Hi-Bred Int., Inc., since 1993. He holds a B.S. degree in agronomy (1973) and M.S. (1986) and Ph.D. (1990) degrees in plant pathology, all from Iowa State University. Lamka has made outstanding contributions to the science and practice of plant pathology through his graduate research, his professional activities throughout his career with several seed companies, and his contributions to professional and trade societies, including APS.

Greg's impact in the areas of seed quality and phytosanitation began as a graduate student at Iowa State University, where he developed an ELISA test for seedborne *Erwinia stewartii.* The test was licensed to Agdia by ISU and is used as the standard method around the world for phytosanitary testing. In his current role as quality supply manager at Pioneer Hi-Bred Int., Greg is responsible for quality assurance programs including ISO registrations related to phytosanitary compliance for movement of Pioneer seed. In addition, he develops and implements strategies for international phytosanitary reform. Through these efforts, Pioneer has upheld the highest quality standards and gained a solid reputation for ethics and responsibility in international seed movement, while maintaining an efficient process that brings the latest crop genetics to growers. He plays a key role in evaluating new seed treatment products offered by crop protection chemical manufacturers, and developing new seed treatment product implementation strategies and budgets, which includes maintaining seed treatment vendor relationships, confidentiality agreements, and research agreements. In this regard, Greg has been a major player in the widespread implementation of insecticidal seed treatments for corn. These products have been revolutionary; industry-wide, over the past 5 years, the use of insecticidal seed treatments in corn has increased from virtually nonexistent to approximately 70% (nearly 60 million acres) of corn planted in 2005. This represents added revenues of over $425 million for the industry. As crop protection chemical providers have developed very safe, cost-effective products, Pioneer, as the world's top seed corn provider, has been well positioned to bring the products into the market place so that a maximum segment of corn growers can take advantage of the economic and safety benefits of controlling insects through seed-applied insecticides. Within Pioneer, these products have been implemented rapidly through a process led by Greg Lamka.

Greg's responsibilities at Pioneer also include external interactions with regulatory agencies on a global basis, and through these duties he has assumed a leadership position in the seed industry on phytosanitary-related issues. The most notable accomplishment in this area was the formation of the National Seed Health System (NSHS). Greg chaired the joint working group between the American Seed Trade Association (ASTA) and USDA-APHIS for 7 years that formulated and implemented NSHS. This initiative allows private and governmental entities to become accredited to conduct phytosanitary inspections, seed health tests, draw official samples, and conduct visual inspections of international seed shipments. The initiative also has a process for standardization of seed health tests and other protocols needed for phytosanitary purposes. The USDA-APHIS requires that seed exported from the United States be tested using NSHS standardized methods; in fact, virtually all the corn and soybean seed and the majority of vegetable seed exported from the United

States is now certified through NSHS-accredited organizations. For these activities, he received the ASTA President's Distinguished Service Award in 2004. Greg's other regulatory-related activities have benefited the entire seed industry. He has chaired the Field Crops Technical Subcommittee of ASTA which deals with international phytosanitary regulatory issues. He is a member of ASTA and the International Seed Federation (ISF) phytosanitary committees, which deal with phytosanitary testing and the free movement of seed in international markets. On behalf of these groups, he has traveled to many countries, meeting with their phytosanitary regulatory representatives to insure all regulations are based on sound scientific principles. He currently chairs the ISF International Seed Health Initiative for Field Crops, which is looking at standardization of seed health tests for field crops worldwide. As a member of the ISF-Seed Treatment and Environment Committee, he recently presented papers at seed treatment symposia in Chile and India, providing information on reduced pesticide use through seed treatments compared with banding or broadcast applications.

In addition to his role in the conception and implementation of NSHS, Greg has accepted a leadership role as president-elect of the board of directors for the Iowa Seed Association, and he also serves on the Iowa State University Dean of Agriculture's External Advisory Panel. Greg is a long-term APS member and currently is a member of the APS Seed Pathology Committee.

Excellence in Teaching Award

This award recognizes an APS member for excellence in teaching plant pathology.

Cleo J. D'Arcy

Cleo D'Arcy was educated as a plant virologist, and for the first 15 years of her professorial career, her primary teaching assignment was a graduate level lecture/laboratory plant virology course. She enjoyed this teaching assignment and, 27 years later, continues to teach plant virology (PLPA 404). However, D'Arcy began to think that her interest and talent in teaching could be used to educate broader audiences about topics in which she passionately believed—agricultural literacy, professional ethics, and college teacher preparation. Toward that end, she developed several unique courses and instructional materials that have been used as models at other institutions.

D'Arcy has designed or co-designed three highly successful courses at the University of Illinois. Plants, Pathogens, and People (PLPA 200) was developed in 1993 in order to teach a broad range of undergraduate students about important agricultural issues that impact their daily lives. The course fulfills general education requirements in advanced composition and natural sciences and has been filled (75 students) during preregistration each of the past 12 years. Students learn facts and concepts about plant diseases and related issues in class, and they enhance and apply their learning by reading and writing about issues such as genetic engineering, pesticide use, and biodiversity. Over the years, D'Arcy has developed multiple instructional formats and media for use in PLPA 200. One current focus of her research is evaluation of the effectiveness of these approaches for students with different learning styles.

To supplement this course and to provide an agricultural literacy tool to others, D'Arcy and her colleagues (primarily Darin Eastburn) have developed an extensive public website. The Plant, Pathogens, and People (PPP) website (http://www.ppp.uiuc.edu) is designed to allow college and advanced high school students to independently learn about agriculture and related complex issues through plant pathology examples. Currently, modules on four important diseases are available: crown gall, Dutch elm disease, late blight, and soybean cyst. The National Science Foundation funded an expansion of the PPP site, which was selected "Site of the Month" in the Plant Pathology Internet Guidebook. Students in courses at several universities in the United States and other countries have used the resource materials and virtual activities available on the PPP site.

D'Arcy has always had a strong interest in professionalism and professional ethics. She began teaching graduate students about these topics in a series of informal evening classes in 1982 with Wayne Pedersen. This evolved into the course Professionalism and Ethics in the Agricultural and Natural Resource Sciences (CPSC 590), which currently enrolls 15 to 20 students from across the College of ACES each year. D'Arcy continues to lead this course, working with several other faculty members and numerous guest speakers from campus, businesses, and other organizations. Students learn about and discuss topics such as mentoring, scientific writing and editorial processes, oral and poster presentations, money and people management, getting and keeping a job, and conflict resolution. Each student prepares and leads a discussion related to a class topic. This class has served as the model for professionalism courses at other U.S. institutions, including the University of Arkansas, the University of Georgia, North Carolina State University, and Oklahoma State University.

In 1997, D'Arcy led a team of four faculty members in her college to design and implement Teaching College. Over 160 new faculty, post-docs, and graduate students have learned about learning theory and teaching methods through this innovative 10-week course. D'Arcy has led sections on a variety of topics, including learning styles, discussion leadership, teaching portfolios, and instructional technology. Peer observation and mentoring are important aspects of the class, and she has been instrumental in these activities across her college. The success of this course is evidenced by the development of a community of teachers who regularly share their experiences and knowledge. In 2000, D'Arcy and the co-instructors of *Teaching College* were honored as recipients of the first annual Team Award from their college.

Since D'Arcy became the Department of Crop Sciences teaching and advising coordinator in 1995, she has been one of two co-instructors in the Undergraduate Crop Sciences Seminar (CPSC 498), the department's capstone writing and speaking experience for undergraduate majors. D'Arcy presents information on and models effective communication skills, and the students "learn by doing." Each student's presentation is evaluated by his or her peers and the instructors, and writes a paper on a topic related to crop sciences. The department submits the best

papers to the American Society for Agronomy manuscript competition, and D'Arcy is extremely proud that one or more of her students have been national winners every year that she has co-taught the course.

D'Arcy has written three and edited many of the APS online lessons in plant pathology (published online by APS) for students in introductory plant pathology courses. In addition, she is the co-creator (with Dr. Eastburn) of two videotapes on plant diseases which are distributed by APS PRESS for use in plant pathology courses around the world. Recently, D'Arcy has published several articles on her teaching scholarship in order to share what she has learned with her peers, and she has co-authored (with Gail Schumann) an introductory plant pathology textbook published by APS PRESS in 2006.

Over the years, D'Arcy has gradually evolved from being a plant virology researcher with an interest in teaching, to a teacher who keeps her hand in research. This is how she wants it, because for her it is true that—as one University of Illinois bumper sticker says—"I'd rather be teaching."

International Service Award

This award recognizes outstanding contributions to plant pathology by APS members for countries other than their own.

H. David Thurston

David Thurston has been selected for the APS International Service Award. It is hard to imagine a more deserving candidate for this honor. Thurston has dedicated his long and distinguished career to service in international agriculture with a central focus on plant pathology. His many contributions include service as a plant pathologist in Colombia, research and publications on tropical crops and their diseases from a position as faculty member at Cornell University, and the training of graduate and undergraduate students from the United States and many developing countries. He has been an inspired champion of sustainable agriculture and a tireless advocate for the world's poor.

Thurston's website entitled, "Smokin' Doc Thurston's Greatest Hits," reflects both the substance and the spirit of his career. The site's title captures Thurston's sense of humor and irreverence; the contents reflect his dedicated service, generosity, and vast knowledge and experience gained from decades of engagement with practical plant pathology in the international context. The site features over 2,500 photos, which Thurston collected during a half-century of travels to many parts of the world. Thurston has used these photos in courses on general and tropical plant pathology, international agriculture and sustainable development, and traditional farming practices. The photo collection is provided to the public, free of charge, with a searchable database, in the hopes of encouraging others to use the material (http://www.tropagfieldtrip.cornell.edu/docthurston/smokinhome.html).

Thurston is a pioneer in the area of sustainable crop management. Well ahead of most of the rest of us, Thurston recognized the relationship between traditional and indigenous cropping practices and the conceptual basis for the design of more sustainable cropping practices for contemporary times. He has documented the principles and practices employed in indigenous cropping systems in his 1992 book entitled, *Sustainable Practices for Plant Disease Management in Traditional Farming Systems*. While his interest has been the agricultural practices of resource-poor farmers in developing countries, his book and the 3,200-entry literature database he compiled have clear and critical implications for the design of sustainable modern agriculture in the United States and elsewhere. Thurston has written several other books (two with Spanish translations) on tropical plant diseases, slash/mulch agricultural systems, and other topics related to sustainable agriculture and contributed chapters to many more.

Thurston spent 11 years with the Rockefeller Foundation as a plant pathologist with the Colombian potato program in the 1950s and 1960s. He began as an assistant plant pathologist, and after a brief return to the United States, was reappointed as director of the Colombian Plant Pathology Program, and then as director of the Potato Program. He also served as the director of the Department of Plant Science of the Colombian Agricultural Institute. He has continued to support the Latin American Phytopathological Society and to engage actively with issues of relevance to the region. In Colombia and subsequently at Cornell University, Thurston's research contributions have focused mainly on disease resistance in root and tuber crops (potatoes and cassava), and on the sustainable practices for managing plant diseases in traditional farm systems. Thurston guided 22 students through their advanced degrees in plant pathology and served on the committees of dozens more. A substantial proportion of his students have been international students who have gone on to influential positions. Others were young Americans who went on to develop illustrious careers of their own in international agriculture. His former student Bob Zeigler, for instance, is now the director general of the International Rice Research Institute.

One of Thurston's research interests has been in mulch-based agriculture. This is a topic that is central to the larger issue of sustainable agriculture. Thurston's vision added to interest in the topic has had wide-ranging impact. He and his colleagues organized an interdisciplinary working group on mulch-based agriculture and organized a meeting (in Spanish) on slash/mulch agriculture with over 90 participants in 1992. This activity continues at Cornell through the MULCH-L listserv, which brings together and serves a dynamic community endeavoring to improve the use of cover crops and green manures to enhance soil health and agricultural productivity of those who have little access to other sources of fertilizer. One active and effective proponent of green manures is Steve Sherwood, one of Thurston's many former students.

In addition to guiding many international scientists through their advanced degrees, Thurston has, via eight different courses, provided enormous numbers of U.S. undergraduates with a glimpse into tropical agriculture and an understanding of the key

issues. For example, for over 30 years, Thurston supported a course involving a 2-week trip to a developing country, in which over a thousand Cornell students have participated. Even now, at 79 years of age, Thurston is packing the house: as an emeritus professor, he fills a 40-person classroom to its capacity in a course he originated on Traditional Agriculture.

Thurston has served on a great number of international committees, panels, consortia, and the like. For example, he served as a member of the National Academy of Science's 1976 World Food and Nutrition Study, and served for a decade as a member of the FAO Panel of Experts on Integrated Pest Control. He spent many years as a member of the Tropical Plant Pathology Committee and the International Cooperation Committee of APS. He was chair of the Board of Directors of the Consortium for International Crop Protection (CICP) from 1985 to 1990.

In summary, Thurston has been a dedicated contributor to and supporter of international plant pathology for decades. He has influenced generations of U.S. students to pursue careers in international agriculture, and has prepared generations of international students for leadership positions in their respective national programs. He has raised awareness of policy makers and the public with regard to issues of world hunger and sustainable agriculture, and his legacy of books and photos will serve as key resources for future generations of U.S. and international plant pathologists.

Lee M. Hutchins Award

This is an award to the author or authors of published research on basic or applied aspects of diseases of perennial fruit plants (tree fruits, tree nuts, small fruits, and grapes, including tropical fruits, but excluding vegetables).

Chang-Lin Xiao

Chang-Lin Xiao was born on August 27, 1964, in Wuhan, China. He completed his B.S. degree in plant protection at Huazhong Agricultural University, China, in 1985, and M.S. and Ph.D. degrees in plant pathology at China Agricultural University (formerly Beijing Agricultural University), China, in 1988 and 1991, respectively. He then worked as assistant professor at Beijing Agricultural University from 1991 to 1994; visiting post-doctoral scholar with the University of California, Davis, at the USDA Research Station in Salinas, CA, from 1994 to 1996; visiting post-doctoral scholar at UC-Davis in Davis, CA, from 1996 to 1998; and as biologist and post-doctoral researcher with the University of Florida at the Gulf Coast Research and Education Center in Dover, FL, from 1998 to 2000. Xiao joined the faculty of the Department of Plant Pathology at Washington State University in 2000, where he is currently associate plant pathologist and extension plant pathologist, located at the WSU Tree Fruit Research and Extension Center in Wenatchee, WA, with primary responsibility for postharvest pathology. Xiao has an impressive record of accomplishments given the short time since receiving his Ph.D. degree. Xiao was associate editor for *Phytopathology* from 2002 to 2004 and served on the APS Plant Disease Losses Committee from 1998 to 2000. He is currently a member of the Postharvest Pathology and Pathogen Resistance Committees of APS.

Xiao is recognized for his contributions to our understanding of postharvest diseases of apples and pears and in particular the identification of three newly discovered postharvest pathogens of pome fruits.

Postharvest fruit rot diseases are an important economic constraint in the production and distribution of apples and pears in the U.S. Pacific Northwest. The reduction in quality and volume during storage, as a result of decay, and the associated repackaging of fruit, costs the tree fruit industry millions of dollars annually. These losses have characteristically been attributed to fungal pathogens inciting the storage rots gray mold and blue mold. However, during the past 5 years at WSU, Xiao has discovered three new postharvest diseases in pome fruits in the United States: Phacidiopycnis rot caused by *Potebniamyces pyri* (anamorph *Phacidiopycnis piri*), Sphaeropsis rot caused by *Sphaeropsis pyriputrescens* Xiao & J.D. Rogers, and a fruit rot disease caused by *Phacidiopycnis washingtonensis* Xiao & J.D. Rogers. The latter two diseases were the first reports in the world and the causal agents have been described as new fungal species. In Washington State, *P. piri* and *S. pyriputrescens* were found to be responsible for one-fifth to one-third of the losses resulting from postharvest decay of d'Anjou pears and Red Delicious apples, respectively. These findings represent significant contributions to the knowledge base of postharvest diseases of pome fruits.

Phacidiopycnis rot and Sphaeropsis rot are economically important to the fruit industry in the Pacific Northwest and Xiao has since been conducting research to address the biology, epidemiology, and control of these diseases. One common characteristic of these three pathogens is their association with cankers and twig dieback of trees in the orchard and their ability to cause latent infection of fruit in the orchard leading to fruit rot during storage. Xiao has thus sought to elucidate the relationships between the tree phase of these canker-causing fungi in the orchard and the fruit-rot phase in storage, and to use this knowledge as the basis for developing and implementing pre- and postharvest integrated strategies for disease control. As a result of this work, growers now possess information on appropriate chemistries for suppression of these decay pathogens when employed as a preharvest treatment in the orchard environment. This approach is unusual in the sense that the orchard phase of postharvest diseases has been frequently overlooked and undervalued in potential approaches to disease control. Xiao's accomplishments represent significant contributions to the science of plant pathology and will have a major impact on the tree fruit industry in the U.S. Pacific Northwest in terms of reducing economic losses resulting from postharvest diseases.

Xiao has reported on this work in a series of seven papers and two notes published in *Plant Disease*, *Phytopathology*, *Mycologia*, and *Mycological Research* in 2004 and 2005, and 12 abstracts published in APS journals from 2002 to 2005. All of Xiao's work on these diseases has been accomplished since he joined the Department of Plant Pathology at WSU in August 2000.

Ruth Allen Award

This award recognizes individuals who have made an outstanding, innovative contribution to research that has changed, or has the potential to change the direction of research in any field of plant pathology.

Thomas J. Baum

Erick J. Davis

Richard S. Hussey

There are few examples of teams in the plant pathology scientific community that have made a greater impact on their field than that made by Richard Hussey, Eric Davis, and Thomas Baum on our understanding of how plant-parasitic nematodes establish a parasitic relationship with their plant hosts. Hussey is widely recognized as a pioneer of molecular plant nematology. Davis and Baum received post-doctoral mentorship in the Hussey lab and while continuing a close collaborative relationship with the Hussey lab, each have established themselves in their own right in the field of molecular plant nematology as evidenced by publications and competitive grants received on their own. In addition to their individual and collective scholarly contributions to molecular nematology, they have also each made significant commitments to mentoring through graduate education and post-doctoral positions as evidenced by the number of scientists emanating from their programs that currently hold university faculty and USDA and industry research positions. Further evidence of their stature is the role these three play in an international union of plant nematologists that meets regularly to freely exchange information and publish together on selected topics. This team is the core of that group and provides the energy to maintain the productive associations.

The focus of their efforts is on the most economically important group of plant-parasitic nematodes. These are the root-knot and cyst nematodes that are sedentary, endoparasites of plants. They have developed innovative approaches to study the earliest stages of the parasitic relationship between the nematode and the plant. These efforts were directed at elucidating the components of stylet secretions (nematode equivalent of saliva) produced in the esophageal gland cells. They have not only adapted tools, such as micro-aspiration of the gland cell contents for cloning parasitism genes, and utilized classical techniques for enzyme isolation and characterization, but have also extended this research by using model systems such as the *Arabidopsis–Heterodera schachtii* and microarrays to profile the expression of known proteins and to identify new candidates involved in nematode pathogenesis. The results of these efforts have not only been published in the expected disciplinary journals such as the *Journal of Nematology*, *International Journal for Parasitology*, *Molecular Plant Pathology*, and *Molecular Plant-Microbe Interactions*, but have reached the wider audiences of *Gene*, *Plant Cell*, *Plant Journal*, and *PNAS*. They have also published analyses of this research in numerous reviews.

This research began to receive significant attention with the report of the first cellulase isolated from animals, a beta-1,4-endoglucanase. This was accomplished by the traditional approach of isolating candidate proteins with antibodies made against stylet secretion extracts. The subsequent group effort of isolation and characterization of the gene revealed a similarity to cellulases of bacterial origin and, thus, the suggestion of horizontal gene transfer between bacteria and nematodes. This seminal research spawned a body of literature on the isolation and characterization of cellulase genes from a variety of nematodes as well as in planta localization and developmental regulation of these genes during penetration and migration of the nematode. The global question of the role of these cell wall-degrading enzymes in nematode pathogenesis was resolved in a *Plant Cell* paper from the Davis laboratory demonstrating that the cellulases are secreted into plant roots only during the penetration and migration phases of nematode parasitism. Synthesis of these enzymes is turned off once syncytia formation is initiated. The body of pioneering information published by these investigators has identified over 60 cyst nematode and more than 50 root-knot nematode parasitism genes encoding a variety of secretory proteins including cellulose-binding proteins, pectate lyases, chitinases, venom allergen-like proteins, chorismate mutases, novel ubiquitin extension proteins, and signaling peptides. Over 65 of the parasitism genes have unknown functions and are unique to plant-parasitic nematodes. This team is now targeting functional analyses of the parasitism genes to dissect the molecular interactions of the root-knot and cyst nematodes with their host plants using gene expression analyses and RNA interference technology. In an *MPMI* paper, the Hussey laboratory recently demonstrated that a root-knot nematode secretory peptide stimulates root growth by directly interacting with a plant transcription factor. While early efforts focused on the nematode side of the equation, recent research from the Baum laboratory has utilized *Arabidopsis* mutants to investigate the host response to nematode parasitism in the *Arabidopsis–H. schachtii* pathosystem. They developed a high through-put system taking advantage of *Arabidopsis* microarrays to study plant gene expression. In a series of papers, they were able to demonstrate that *Arabidopsis* susceptibility to *H. schachtii* is modulated by the ethylene signal transduction pathway. *Arabidopsis* has also served as a model for the team to demonstrate that a cyst nematode parasitism gene product has a function similar to the CLAVATA3 signaling peptide that regulates plant stem cell fate.

Individually and collectively, these researchers have amassed an enviable record in the primary literature as well as reviews and book chapters. Collectively, the research from these three groups has advanced from a hypothesis focused on the role of nematode parasitism proteins to the elucidation of specific nematode enzymes and signaling peptides and the implication of plant metabolic pathways to provide a framework for understanding nematode parasitism. This effort began with the original biology and investigations of the root-knot nematode secretory proteins with Hussey and his mentorship of Davis and Baum (as well as others); however, these three have maintained dominant roles with Davis advancing the molecular biology and then Baum

joining the efforts of the molecular investigations of the plant side of the relationship and more recently developing the functional genomics. While their collaborative spirit is widely known, it must also be acknowledged that they have maintained independence as evidenced by their independent records of competitive funding, publishing, and mentoring. The Hussey legacy of mentoring is also being continued by Davis with former students and post-docs in faculty or USDA positions at the University of Missouri and Cornell. Baum has placed a USDA scientist at Mississippi State University. This represents an effort not only in scholarship but also to the continuation of the discipline through mentoring of the next generation of scientists.

Syngenta Award

This award is given by Syngenta Crop Protection to an APS member for an outstanding recent contribution to teaching, research, or extension in plant pathology.

Guo-Liang Wang

Guo-Liang Wang is being nominated for the APS Syngenta Award for his numerous and significant contributions on the molecular genetics and genomics of plant and microbe interactions, especially on the elucidation of the molecular basis of host resistance to two important rice pathogens: *Xanthomonas oryzae* pv. *oryzae* and *Magnaporthe grisea*. In a few short years, he has become one of the leading scientists on molecular genetics and genomics of plant disease resistance, and has opened up new research territory for numerous investigators. His work on rice, the staple food of billions of people around the world, has had wide reaching impact. His highly significant research contributions include the isolation and characterization of several broad-spectrum resistance genes to *X. oryzae* pv. *oryzae* and *M. grisea* as well as pioneering the use of the LongSAGE and MPSS technologies for defense transcriptome analysis. The bacterial blight resistance gene *Xa21* cloned by Wang and his colleagues when he was a post-doc fellow in Pam Ronald's laboratory at UC Davis is being widely used in China, India, and other Southeast Asian countries to engineer broad-spectrum and durably resistant rice cultivars. Generation of a large set of rice expressed sequence tags (ESTs), LongSAGE and MPSS tags, from *X. oryzae* pv. *oryzae*- and *M. grisea*-infected rice plants by his group has provided the scientific community with very useful genomic resources for functional analysis of defense genes in rice and other cereals. Wang's lab has been extremely well-funded from sources as diverse as NSF, USDA, Rockefeller Foundation, USAID, and industry. Since his Ohio State University appointment in October 1999, he contributed to raising more than $18 million in funds, of which $3.7 million directly supported his program.

Wang received his B.S. degree in plant genetics from the Hunan Agricultural University in China in 1982. He then attended the Fujian Agricultural University where he received his M.S. degree in plant genetics and breeding in 1985. In June 1988, he was admitted to the International Rice Research Institute and the University of Philippines as a Ph.D. candidate. After he obtained his Ph.D. degree in plant genetics and breeding in June 1992, he served as a post-doctoral fellow at Texas A&M University with Andrew Patterson for one year before joining UC Davis to work with Pam Ronald on the map-based cloning of the *Xa21* gene. From June 1996 to September 1999, he was a senior scientist and principle investigator at the Institute of Molecular Agrobiology, National University of Singapore. In October 1998, Wang was appointed assistant professor of plant molecular genetics at the Ohio State University (OSU), Department of Plant Pathology, and was promoted to associate professor in 2004. His appointment is 70% research and 30% teaching.

Wang has made several outstanding contributions to the science of plant pathology that have been described in 50 journal articles and book chapters. One major accomplishment involved the cloning and characterization of the first rice resistance gene *Xa21*, which he published in *Science* in 1995 as a co-first author. *Xa21* is the first plant resistance gene encoding a receptor-like protein kinase. He then isolated and characterized another gene, *Xa21D*, that confers partial resistance to *X. oryzae* pv. *oryzae* and published the paper in *Plant Cell*. When he established his lab at the National University of Singapore, he initiated several new projects aiming at understanding the molecular basis of host resistance to *X. oryzae* pv. *oryzae* and *M. grisea*. One of these projects resulted in a collaborative publication in *Nature* on the first example of *R* gene regulation through activation of gene expression by its cognate avirulence gene. At OSU, Wang has continued to work on the rice blast resistance projects and expanded his research into the emerging plant genomics area. In collaboration with his students and post-docs, he cloned in the last few years four genes that confer broad-spectrum resistance to rice blast. Cloning of these genes provided an excellent starting point to identify the critical domains governing the resistance specificities to pathogens and evolution of resistance gene clusters. Transformation of these four rice blast resistance genes into susceptible rice cultivars that are grown in the United States and other countries may have a great impact on rice production and food security in developing countries. Another important finding from his lab was the cloning of the first plant U-box/ARM repeat gene that regulates the program cell death and disease resistance. The new findings from this study were recently published in the most respected plant science journal, *Plant Cell*. In addition, in the last 3 years, the Wang laboratory has been actively involved in plant genomics studies and generated about 70,000 rice ESTs, 1.5 million LongSAGE tags, and over 30 million MPSS tags as part of two NSF-Plant Genome Program funded projects. All these sequences were submitted to public databases and are a tremendous genomic resource for the community.

Wang is highly committed to the education of students in the areas of plant genetics, molecular biology, and genomics. In 2000, he developed a new course called Agricultural Genomics together with Sophien Kamoun in the Department of Plant Pathology at OSU. This is the first course on agricultural genomics offered at OSU, and the course content is contemporary. Wang also developed four new genomics lab sessions in the laboratory course PP/HCS604.03. He played important roles in the Kowlett seminar, the interdepartmental graduate program in Plant Molecular Biology and Biotechnology (PMBB). He also co-organized the molecular plant–microbe interactions symposium, a research forum at OSU. Wang currently is supervising four Ph.D. level graduate students and three undergraduate students. He also has supervised five post-doc fellows in his lab. He has hosted six NSF REU summer intern students in the last 3 years.

Wang's knowledge and expertise is in much demand around the world, especially in Asian countries where rice is an important

crop. Over the years, he offered more than 45 invited seminars and presentations at several national and international institutions, as well as at international conferences, including the Keystone Conference; the Gordon Conference; Plant, Animal and Microbe Genomes Conference; the Rice Functional Genomics Meeting; and Rice Genetics Meeting. There is a steady stream of international scholars visiting his laboratory, to either learn techniques about molecular genetics, plant–microbe interactions, or genomics. Wang has served as a panel member in two USDA-National Research Initiative programs. He has served as an ad-hoc reviewer for more than 15 journals and more than seven grant agencies or research foundations. In 2005, Wang received the OARDC Junior Research Award in recognition of his significant contributions.

William Boright Hewitt and Maybelle Ellen Ball Hewitt

This award recognizes a scientist within five years of their Ph.D. degree who has made an outstanding, innovative contribution directed toward the control of plant disease.

Koon-Hui Wang

Koon-Hui Wang was born in Kuala Lumpur, Malaysia. She received her B.S. degree in horticulture from the National Taiwan University in 1993. She then enrolled at the University of Hawaii at Manoa and received her M.S. degree in horticulture in 1996 and Ph.D. degree in plant pathology in 2000. After leaving Hawaii, she became a post-doctoral research associate at the University of Florida in Gainesville and was promoted to assistant research scientist in 2005.

Wang's research has focused on the integrated management of soilborne pest problems, including nematodes, fungi, and weeds. For some crops, such as new species and cultivars of commercial cut flowers, little information was available on pests and their management. In these cases, Wang conducted basic studies to determine pathogenicity of the root-knot nematode *Meloidogyne incognita* and soilborne fungi (*Fusarium oxysporum*, *Pythium aphanidermatum*) to lisianthus and snapdragon. In addition, she determined which cultivars of these and other cut flower species are resistant or tolerant to these important pathogens. She has demonstrated the efficacy of soil solarization against a range of soil pests. However, in pest management, her main focus and strength has been the integration of multiple tactics including soil solarization, cover crops, organic amendments, plant resistance, and biological control as alternatives to methyl bromide for managing soilborne problems. Fumigation with methyl bromide has long been the standard practice for pest management in soil systems. By combining several nonchemical tactics, Wang has achieved levels of control of nematodes, diseases, and weeds that approach the performance of the methyl bromide standard. She continues to research and perfect these nonchemical alternatives individually and in combination. She is particularly interested in crops such as sunn hemp and cowpea that can function as both rotational cover crops and amendment sources, and has conducted experiments to show that the rotation effect was more critical than the amendment in suppressing root-knot nematodes. Rather than restricting her work to one agricultural commodity, Wang has shown that many of these pest management principles and practices are transferable to a wide range of crops, including a number of vegetable crops, and ornamentals such as cut flowers and caladiums.

While she has made much progress in the integrated management of soilborne pests, the most impressive feature of Wang's work is that these efforts have been integrated into the larger context of management of soil health in agroecosystems. Her objective is overall plant health, of which pest management is only one part. Pests and plant pathogens are not alone in the agroecosystem, but are surrounded by a great diversity of other organisms, many of them potentially beneficial in improving plant health. She emphasizes that free-living nematodes involved in nutrient cycling benefit plants by improving overall nutrient uptake and ultimately plant health. Using her knowledge of soil ecology, she is perfecting the use of cover cropping in sustainable agricultural systems. She integrates the concept of cover cropping for nematode management with soil nutrient management, to recommend the optimal timing for cover cropping in subtropical regions. She has documented the impact of several soil management practices on the entire soil nematode community, finding greatest impact on beneficial omnivorous and predatory nematodes following severe practices such as fumigation with methyl bromide. She is especially interested in biological control and the potential of practices such as use of organic amendments for simulating biological control agents. She has made much progress in understanding and clarifying the ecological conditions useful for stimulating omnivorous and predatory nematodes as well as nematode-antagonistic fungi. The stimulation of nematode-trapping fungi is especially problematic. There is a need to add organic matter to stimulate such fungi, but if the carbon-nitrogen ratio of the organic matter added is not appropriate, the fungi will not form traps. Wang has discovered the response of the fungi depends on the types of fungi involved, as well as on soil and field history, particularly the quantity and quality of organic matter already present in the soil.

Wang's research findings have been presented in five invited symposia at recent national meetings, in an APS*net* Feature Article in January 2005, and in 19 refereed journal articles and 18 papers and chapters in meeting proceedings. Wang also has been very active in working with growers and presenting her results so that they can readily apply her findings in managing their soilborne pest problems and ecosystem health. She has developed two websites and published several online articles that are user-friendly and very useful for growers. She has been invited to present her work to growers not only in Florida, but in two other states as well.

In addition to her many research accomplishments, Wang has served APS as chair and vice chair of the Nematology Committee, organized a nematology symposium at the 2005 meeting in Austin, and co-organized a nematology symposium at the 2004 meeting in Anaheim. She also has been active in the Society of Nematologists (SON) and served as chair and vice chair of the Biological Control Committee, organized two symposia at SON national meetings, and initiated the First Nematode Biological Control Images Competition at the SON meeting in 2005. She has also organized and taught a course on nematode biological control for graduate students at the University of Florida.