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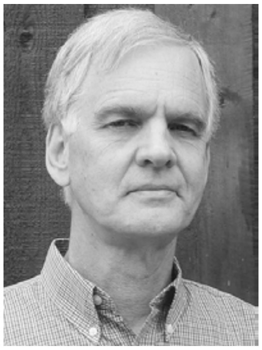
Clive Brasier



Clive Brasier was born in Buckinghamshire, Great Britain, in 1942. He received his B.S. degree in botany in 1963 and his Ph.D. degree in mycology in 1966, both from the University of Hull, England. He was awarded the D.Sc. in plant biology and genetics in 1984, also from Hull. After working as a research fellow in the genetics department at the University of Birmingham, Professor Brasier joined the British Forestry Commission's Research Division as a senior scientific officer, later becoming the highest-grade scientist in the Division. He officially retired from the Forestry Commission in 2002 but maintains a unique status as Emeritus Mycologist with that agency and a visiting professorship at Imperial College in London. His professional pace has only increased since retirement.

Clive Brasier's research program has made significant contributions in several different areas of plant pathology. The most noteworthy of these have dealt with the population biology, taxonomy, and international spread of Dutch elm disease and *Phytophthora* pathogens; biological control of forest pathogens with fungal viruses; rapid pathogen evolution via interspecific hybridization and "jumping genes"; fungal species concepts and fungal speciation processes; and the risks posed by plant health and international trade protocols. Of special note is the discovery that the resurgence of Dutch elm disease in Europe resulted from the introduction of a new, highly virulent species of pathogen. This highlighted the dangers posed to forests and natural ecosystems by invasive pathogens. The result has been an unprecedented documentation of the global ecological genetics of the pathogens and a concurrent view of the evolutionary and ecological forces driving the epidemics. This work has greatly influenced modern thinking on how introduced plant pathogens can change and evolve and how the risk posed by these processes can be assessed.

In addition, Professor Brasier has been influential in the arena of *Phytophthora* research through his work on the evolutionary biology of the genus. This has included studies on physiological mechanisms of heterothallism and self-fertility; production, with the late Eva Sansome, of the cytological evidence for diploidy in various species including *P. infestans*; and work elucidating species structure and molecular phylogeny of *Phytophthora* complexes, including important *Phytophthora* pathogens of cocoa, forests, and natural ecosystems. Recently, he has shown, with colleagues in the United Kingdom, that a new *Phytophthora* pathogen killing alders across Europe comprises a swarm of heteroploid, unstable, and still evolving hybrids between two or more different *Phytophthora* species. This nicely parallels other recent work from his group, showing that mating type and vegetative compatibility genes are jumping the species barrier in *Ophiostoma* species.

Undoubtedly, Professor Brasier is one of the world's foremost mycologists/pathologists specializing in tree diseases. He is the former chair of the International Union of Forest Research Organizations (IUFRO) Working Group on vascular wilts, and he cofounded and is currently the co-chair of the IUFRO Working Group on *Phytophthora* species. A major reason for the widespread interest in Professor Brasier's work is its strong international dimension. This is illustrated by his detailed tracking of the changing face of Dutch elm disease around the world and his demonstration of the role of *P. cinnamomi* in the widespread live oak mortality in the Iberian Peninsula. Most recently, he recognized that another *Phytophthora* species causing a serious new disease of oak in California was already present in Europe and could pose a threat to trees in the United Kingdom.

In collaboration with Professor Ken Buck and colleagues at the Imperial College, Clive Brasier's pioneering work on the viruses infecting the Dutch elm fungal pathogens and their possible exploitation for biological control has received considerable international interest. A major contribution was the discovery and molecular characterization of the novel mitochondrial viruses, which are now classified in the genus *Mitovirus* in the family *Narnaviridae*. In parallel, he has characterized the pathogen's genetic systems that control virus spread. Collaborating with colleagues in Dundee, Scotland, Clive Brasier has also helped successfully pioneer methods of genetic transformation of elms as a means of introducing novel resistance into threatened native elm species.

Clive Brasier leads a small team of researchers at Alice Holt and (with Ken Buck) at Imperial College and is an inspiration to them all. He expects much from them but always expects even more from himself. Over the years, he has acted as a mentor to a stream of young scientists and students and has always been generous in sharing ideas and time. His work is of the highest quality, as evidenced by his many publications in some of the most prestigious international journals. The quality of Professor Brasier's work and his ability to collaborate has also attracted many research workers from around the world. Students as well as senior researchers come to Britain to work with him, and he in turn works regularly with scientists in Britain and throughout Europe and in Asia, Australia, Canada, and the United States.

Clive Brasier's international stature is also evident in his service on various review panels, research advisory committees, and in international research consortia such as the European Union and NATO. He has also been a featured symposium speaker at many International Mycological Congresses and International Congresses of Plant Pathology. In recent years, he has presented invited overviews on threats from invasive diseases, hybrid pathogens, and associated quarantine issues at a range of agency- and academic-led symposia across the United States. When APS wanted an international perspective for their online discussion of invasive pathogens on timber and the most recent online discussion of Sudden Oak Death, they turned to Professor Brasier.

Jeremy J. Burdon

Jeremy J. Burdon was born June 19, 1950, in Singapore. He graduated from the Australian National University in 1972 with a First Class Honors degree in botany and subsequently in 1976 with a doctorate focused on the epidemiology of airborne pathogens. He was awarded both a CSIRO postdoctoral fellowship and an 1851 Overseas Scholarship and used these to spend two years at the University College of North Wales studying the epidemiology of disease in varietal mixtures and the role of disease in plant communities. This latter topic is one that has been a central theme of much of his subsequent career.

In 1978, Burdon returned to Australia as a prestigious Queen Elizabeth II Fellow and joined the Division of Plant Industry, CSIRO. In 1980, he accepted a tenured position in the Division and has subsequently been promoted to the most senior research rank possible of Chief Research Scientist. In addition to running his own research program involving a senior research fellow and two postdoctoral scientists, Dr. Burdon is responsible for a significant administrative role as assistant chief of this Division of approximately 800 staff.

Over the 25 years of his professional career, Dr. Burdon has developed and maintained a range of interests integrating strategic and tactical research of agricultural and natural ecosystems to develop an understanding of the role of diseases as evolutionary forces shaping plant communities. He has applied this, and other pathological, epidemiological, and genetic knowledge, to more immediately practical pathogens, including the identification and prebreeding of alleles for resistance to *Rhynchosporium secalis* (scald of barley).

During his career, Dr. Burdon's wide interests in plant–pathogen associations and his readiness to focus on questions anywhere along the strategic–tactical research continuum have led to his involvement in the use of fungal pathogens as weed biocontrol agents and in a program to utilize the wild genetic resources offered by *Hordeum spontaneum* as a source of resistance genes. His biocontrol research combines both basic and more applied work, ranging from studies aimed at enhancing control success rates to the release and monitoring of the rust pathogen *Puccinia cardui-pycnocephali* for the control of slender thistle (*Carduus* spp.) in southern Australia.

Overlying these interests are two major topics that have been recurring themes in Dr. Burdon's career and are perhaps the areas for which he is most well known: (i) the sources and maintenance of variation in pathogen populations and (ii) the role of pathogens as selective agents in natural plant populations and communities. Dr. Burdon's interest in the structure of pathogen populations led initially to extensive collaborations with the Plant Breeding Institute, University of Sydney. This culminated in 1983 in a nine-month visit as E. C. Stakman Visiting Professor and Fulbright Scholar to the Department of Plant Pathology and the USDA Cereal Rust Laboratory at the University of Minnesota. That productive visit set the scene for continuing work with Robert Park and his colleagues at Sydney on the origin and nature of novel variants of wheat leaf and stripe rust in Australia.

During the 1980s, Burdon expanded his work on the structure of plant–pathogen systems with studies of wild-crop interactions (wild oats–oats–*Puccinia* species), wild crops relatives (wild soybean–*Phakopsora pachyrhizi*), and other natural systems. The importance of this work was recognized in 1987 when he received the Gottschalk Medal, awarded by the Australian Academy of Science to young scientists of particular merit. It was also at this time that he initiated work on the Australian native interaction between *Linum marginale* and *Melampsora lini* that has developed into the best-documented natural host–pathogen system.

In 1987, Dr. Burdon published a significant monograph, *Diseases and Plant Population Biology*, that drew heavily on agricultural experience to illustrate the general thesis that ecologists and evolutionary biologists needed to become aware of the potent role diseases play in shaping the ecological and evolutionary dynamics of natural plant communities. That book had both an immediate and lasting impact on raising awareness in the area. Dr. Burdon has remained at the forefront of that expansion, taking a particular interest in developing a better understanding of the force leading to the evolution of different resistance mechanisms in real-world heterogeneous environments.

In 1990, Dr. Burdon spent a 5-month sabbatical period at the Department of Ecological Botany, Umea University in Sweden, where he established a valuable long-term interaction with Professor L. Ericson, injecting a strong pathology/genetics thrust into the work undertaken there. His major contribution (which has continued to the present) was recognized in 1996 when the university conferred an honorary doctorate upon Dr. Burdon. In the same year, Dr. Burdon's extensive contributions to evolutionary biology, plant pathology, and conservation biology were recognized by election to the Fellowship of the Australian Academy of Science.

Since 1996, Dr. Burdon has continued his research, expanding rapidly into both empirical and theoretical studies of the effects of spatial considerations on the development of plant–pathogen associations. At the same time, he has taken on a significant increase in science administration for both his own group and the Division of Plant Industry as a whole.

One issue of considerable concern to Dr. Burdon in recent years has been the decline in the teaching of pathology in many Australian universities. Currently, he is deeply involved in facilitating the development of a partnership between the Australian National University and a major industry funding body to re-establish teaching of pathology and microbial science at the university after a hiatus of seven years. That partnership will see undergraduate teaching at the university being supported by assistance in postgraduate training in a wide range of pathology-related issues within CSIRO.

Martin B. Dickman

Martin B. Dickman was born in Flushing, New York, on February 16, 1953. He received his B.S. degree in horticulture and his M.S. and Ph.D. degrees in plant pathology from the University of Hawaii. After a postdoctoral fellowship at the Institute of Biological Chemistry at Washington State University, he joined the faculty at the University of Nebraska in 1987 as an assistant professor, was promoted to full professor in 1997, and is now the Charles Bessey Professor of Plant Pathology.

Dr. Dickman's research program is focused primarily on fundamental studies in fungal–plant interactions, including regulation of pathogenicity genes during fungal pathogen growth and differentiation in host plants, host–pathogen signal communication, and the mechanism of action of fumonisin, a mycotoxin produced in plant tissue with significant pathological consequences for livestock and potentially for humans. He is particularly interested in examining the molecular mechanisms that govern plant disease and stress responses. Early in his research career, Dr. Dickman recognized the potential of molecular and genetic approaches to address fundamental questions in host–pathogen interactions. He characterized an extracellular cutinase from *Colletotrichum gloeosporioides* and determined its role in pathogenesis of papaya through the development and analysis of cutinase-deficient mutants. He showed that insertion of the cutinase gene into a wound pathogen enabled it to infect intact plants. In studies on other fungal pathogens, he developed and analyzed mutants to establish oxalic acid as a pathogenicity factor in *Sclerotinia sclerotiorum* and later showed that it functions by suppressing the oxidative burst. He developed nitrate non-utilizing mutants to study vegetative compatibility and genetic relatedness in *Colletotrichum* species. His studies on the role of cyclic AMP and calcium in fungal development and the participation of signal transduction pathways involving various classes of protein kinases and phosphatases in pathogenesis are among the most thorough and significant contributions in this area of plant pathology.

Currently, Dr. Dickman's primary emphasis is on programmed cell death (apoptosis) and the extent to which parallels exist between plant and animal systems. The overall goals of his studies are understanding the mechanisms that regulate programmed cell death and implementing intervention or alternative strategies to generate transgenic plants with novel mechanisms of pathogen resistance. He generated a number of transgenic model and crop plants that express anti-apoptotic (delayed death) genes from humans, chickens, insects, and nematodes and showed that expression of these genes abolishes disease development in tobacco plants inoculated with various fungal pathogens and viruses. His results suggest that disease development requires common responses and cellular pathways. Characteristic hallmarks of apoptosis, such as DNA fragmentation, occurred in susceptible plants during infection but not in transgenic resistant plants. Plants that he generated with mutations in the transgenes were not protected against the pathogens. Significantly, the transgenic plants also displayed tolerance or resistance to a number of abiotic stresses, e.g., heat, cold, salt, UV light, and drought. Thus, Dr. Dickman has developed a working plant system to demonstrate the efficacy and feasibility for use of some of the most interesting genes in the repertoire of biological systems. The potential scientific and economic benefits of his research are enormous. His interest in potentially common mechanisms of infection by plant and animal pathogens and common mechanisms of resistance led to his key participation in establishing the first national program in comparative pathobiology, which is now a graduate program in the School of Biological Sciences at the University of Nebraska.

Dr. Dickman's teaching activities have been equally innovative. He and colleagues Dr. Tom Wolpert at Oregon State University and Dr. Jan Leach at Kansas State University were the first to use the Internet-2 in a real-time, team-taught course, Molecular Biology of Host–Pathogen Interactions, broadcast simultaneously in three states. This course has been featured in the *Chronicle of Higher Education* as well as in popular print and television venues. Reviews have been outstanding from students. Dr. Dickman's teaching repertoire includes a graduate course on signaling mechanisms and science presentations in local schools from kindergarten to high school. Using plant pathology models and a contagious excitement for science, he presents a biotechnology viewpoint to allay apprehension in tomorrow's scientists and to convey the positive aspects of science and of a university professor.

Dr. Dickman has served APS as a member and subsequent chair of the Biochemistry, Physiology, and Molecular Biology Committee and currently as a senior editor for APS PRESS. He has also served plant pathology by founding and chairing the NCR-173 Committee on the Genetic Basis for Pathogenicity in the Genus *Colletotrichum* and in various review assignments. In addition, he has served on the editorial boards of a number of journals, including *Mycologia*, *Archives of Microbiology*, and *Applied and Environmental Microbiology*, and is currently a senior editor for *Physiological and Molecular Plant Pathology*. He is the recipient of the Distinguished Alumni Award from the University of Hawaii and the University of Nebraska Institute of Agriculture and Natural Resources Junior Faculty Recognition for Excellence in Research Award and is a consultant with the scientific instrument company ISCO Corporation and Idun Pharmaceuticals. For his innovative and creative research contributions, scientific leadership, and service to APS and the plant pathology profession, Dr. Dickman is recognized as a highly deserving recipient of the APS Fellow Award.

Byung Kook Hwang

Byung Kook Hwang was born March 3, 1947, in Junju, Korea. He received his B.S. and M.S. degrees from Seoul National University in 1970 and 1975, respectively. For two years, he was employed as a rice pathologist at the Department of Plant Pathology, National Institute of Agriculture Science and Technology, Suweon, before beginning work on his Ph.D. degree. He obtained his Ph.D. degree in plant pathology in 1981 from Georg-August-Universität Göttingen, Germany, under the direction of Dr. Rudolf Heitefuss and then joined the College of Life and Environmental Sciences (formerly the College of Agriculture), Korea University, where he progressed to the rank of professor in 1987. Between 1988 and 1989, Dr. Hwang was a research scholar on sabbatical at the Institut fur Pflanzenpathologie and Pflanzenschultz, Georg-August-Universität. He was appointed adjunct scientist and plant pathologist at the National Institute of Agricultural Science and Technology in 1994. He served as director of the Institute of Life Science and Natural Resources, Korea University, from 2000 to 2002.

Early in his career, Dr. Hwang conducted research on the mechanism of adult plant resistance and induced resistance of barley to powdery mildew with Dr. Heitefuss. He demonstrated that carbohydrate and protein metabolism was altered during plant development, possibly with some relation to the appearance of adult plant resistance in barley cultivars. Subsequent research by Dr. Hwang showed that systemic acquired resistance was expressed in upper barley leaves upon infection on the lower leaves by *Blumeria graminis* f. sp. *hordei*.

After joining the Korea University in 1981, Dr. Hwang pioneered studies on the cytology, physiology, and molecular genetics of defense responses to *Phytophthora capsici* and *Xanthomonas campestris* pv. *vesicatoria*, which cause Phytophthora blight and bacterial spot disease of pepper, respectively. He isolated and characterized several genes involved in signaling the defense response in pepper. His extensive research achievements have led to a better understanding of the physiological and molecular basis of disease resistance, so as to improve practical disease control by engineering broad-spectrum resistance in peppers. In addition to this research on a pepper–pathogen interaction, Dr. Hwang and his colleagues studied the epidemiology and physiology of adult plant resistance of rice to rice blast, caused by *Magnaporthe grisea*, in relation to blast severity and yield losses in rice. The adult resistance cultivars screened by Dr. Hwang's researchers became useful in the breeding of rice cultivars resistant to rice blast disease in Korea.

Dr. Hwang's research also has led to the isolation of a number of antifungal compounds, including tubercidin, a manumycin-type antibiotic, streptimidone, daunomycin, rhamnolipid B, phenylacetate, and aerugine from the culture extracts of actinomycetes and soil bacteria antagonistic to plant-pathogenic fungi and oomycetes. These antifungal antibiotics that are effective in controlling plant disease are available as active ingredients in fungicides for direct application to diseased plants or as starting points for the development of environmentally friendly biofungicides in agriculture.

Dr. Hwang has supervised 30 M.S. and nine Ph.D. plant pathology students. Two of his former students are currently professors of plant pathology at universities in Korea, and most of his other students hold research plant pathology positions at different universities or research institutes in Korea and the United States. He offers undergraduate and graduate courses on introductory plant pathology, plant–pathogen interaction, plant disease resistance, and molecular plant pathology at Korea University. Dr. Hwang has been particularly active in presenting lectures as well as participating in workshops and symposia on topics related to plant pathology around the world. He has published 114 refereed papers, one book, three book chapters, and other scientific articles.

Dr. Hwang is the recipient of many awards, including the Distinguished Research Award from Korea Science and Technology Association in 1996 and both the Korea University Distinguished Research Award and the Hwa-Nong Foundation Award for agricultural research in 1997. In 1999, Dr. Hwang was elected a member of the Korea Academy of Science and Technology. In 2002, the Korean Society of Plant Pathology recognized him for his outstanding contribution to understanding the physiological, biochemical, and molecular biology of resistance in pepper to Phytophthora blight and bacterial spot diseases.

Dr. Hwang has been an active member of the Korean Society of Plant Pathology since 1984 and is currently the vice president of the society. In 1997, he established the Korean Society of Molecular Plant-Microbe Interactions and served as its president. He is also a member of the International Society for Molecular Plant-Microbe Interactions and the Deutsche Phytomedizinische Geselloschaft. He is currently serving as an editor of the *Journal of Phytopathology*. Dr. Hwang has been a member of The American Phytopathological Society since 1982.

Hei Leung

Hei Leung was born November 5, 1955, in China. He received a B.S. degree in plant science from McGill University in Montreal, Canada, in 1979. He then completed M.S. and Ph.D. degrees in plant pathology at the University of Wisconsin. After completing doctoral studies in 1984, he was awarded a McKnight Postdoctoral Fellowship to work at the University of California, Davis. He has always had a keen interest in international agriculture, and this prompted him to join the International Rice Research Institute (IRRI) in the Philippines in 1986 to begin a distinguished career in rice pathology research. In 1989, he joined the faculty of plant pathology at Washington State University, where he focused on the genetics of the rice blast fungus, *Magnaporthe grisea*. In 1997, he returned to IRRI as a plant pathologist to continue working toward applying molecular biology for solving rice disease problems in developing countries. He also serves as an adjunct professor of plant pathology at Kansas State University.

Dr. Leung is recognized for significant research contributions to many areas of rice–pathogen interactions, including genetic analysis of pathogenicity in the rice blast pathogen, *M. grisea*, the application of pathogen population biology to disease control, and the dissection of qualitative and quantitative disease resistance in rice. He also is recognized for his leadership in the international community toward building and distributing rice genetic and genomic resources and creating capacity in plant pathology in the developing countries of Asia.

During his career, Dr. Leung has made several key contributions to initiate development of the rice blast pathogen as a tractable genetic system, leading to its eventual establishment as a model system. Dr. Leung studied meiosis and ascosporogenesis in the fungus, determined the pathogen's chromosome number, and conducted the first successful crosses in *M. grisea*. In addition, he developed a mapping population and contributed to the development of the first genetic map of the fungal genome. His laboratory conducted some of the first transformation experiments on the fungus and developed an insertional mutagenesis system that was applied to the analysis of morphogenesis, pathogenesis, and sporulation in *Magnaporthe*.

In the mid-1980s, Dr. Leung urged the rice pathology community to develop sustainable control strategies based on principles of population ecology and host–pathogen coevolution. With his collaborators, he developed extensive, systematically designed collections of the rice blast and bacterial blight pathogens, developed molecular marker tools, and applied a series of analytical techniques to understand their population structures and the population genetic process that drive their evolution. The emphasis on knowledge of population biology coupled with an understanding of the evolution of pathogen virulence and avirulence factors represents a fundamental advance for breeding for durable disease resistance. Dr. Leung was active in outreach and training efforts to bring molecular analyses of plant pathogen interactions and population genetic analysis to several national research programs in Asia.

Dr. Leung initiated broad research partnerships to assess the utility of a candidate gene approach for achieving durable resistance with quantitative trait loci (QTL). Dr. Leung and colleagues demonstrated that genes predicted to contribute to a defense response (DR) are associated with QTL for rice pathogens and pests. To assess the utility of candidate DR genes for plant breeding to improve resistance, his laboratory demonstrated that these genes are good predictors of QTL. Furthermore, they demonstrated that accumulation of multiple DR genes into rice cultivars could lead to increased non-race-specific field disease resistance. The expanded understanding of quantitative resistance, emerging from the synthesis of genetic analysis and functional genomics, is likely to revolutionize breeding for quantitative traits.

Dr. Leung has provided strong research leadership in the rice genomics community that will have longstanding impacts on rice as an agricultural crop. In the late 1990s, Dr. Leung realized that to maximize use of the rice genome sequence for functional genomics, several key tools would be needed. He and colleagues at IRRI initiated a program to develop and characterize collections of chemically and physically induced mutants for forward and reverse genetics. This collection, which now exceeds 40,000 lines, has led to the identification of a series of mutations affecting the disease response and other agronomic traits. This mutant resource is now widely used around the world. Dr. Leung established impressive capacity for functional genomics analysis at IRRI, including a microarray facility. Under his leadership, this capacity provides a research platform for researchers in many Asian countries and elsewhere.

Dr. Leung heads the Asian Rice Biotechnology Network (ARBN), through which he provides training and collaborative research opportunities to substantial numbers of ARBN scholars in the applications of advanced technologies to disease control. He also is the coordinator of the International Rice Functional Genomics Consortium. He has organized a large number of workshops, colloquia, and other training events. He served as an associate editor (1993–1995) and senior editor (1997–1999) for *Phytopathology*. He also served as liaison to the Office of International Programs of APS and was a member (1992–1994) and chair (1995) of the APS Genetics Committee. He has served on numerous peer review panels for the USDA-NRICGP. Finally, he has been an inspiring mentor for numerous graduate students and postdoctoral associates.

In summary, Dr. Leung's contributions and achievements have spanned active research in multiple disciplines of plant pathology, breeding, genetics, and genomics. His research is characterized by tremendous scientific scope and depth that links field and laboratory studies. His promotion of collaborative research and his leadership in such programs in the developing world have contributed to the building of a dynamic research community that promotes both basic knowledge and food security for Asia and the world.

Jerald K. Pataky

Jerald K. Pataky was born in Wood River, Illinois, in 1953. Pataky received B.S. degrees in advertising/journalism and agronomy from the University of Illinois, and he worked as an advertising copywriter in Chicago before earning an M.S. degree in plant pathology from the University of Illinois in 1980. In 1983, he received a Ph.D. degree in plant pathology at North Carolina State University. He then joined the Department of Plant Pathology at the University of Illinois as an assistant professor and was promoted to full professor in 1993.

When Dr. Pataky began his research at Illinois, he was encouraged to devote a portion of his time to diseases of sweet corn, because epidemics of common rust had caused substantial yield losses in sweet corn in the Midwest. Pataky soon recognized that important diseases of sweet corn were amenable to quantitative investigation, and since there were few pathologists working on sweet corn diseases, the practical applications of his research were received enthusiastically by the sweet corn seed and food-processing industries. Following his initial work on the epidemiology and control of rust and other diseases, Pataky has emphasized breeding for disease resistance while continuing to investigate epidemiological aspects of other disease-control tactics. His research affects sweet corn production nationally and internationally, in part, because his contributions are magnified greatly by sweet corn breeders and pathologist who incorporate his results into their programs. Colleagues in industry and academia recognize Pataky as a leading authority on the epidemiology and control of sweet corn diseases and disease resistance in sweet corn.

Dr. Pataky works closely with researchers in the seed and food-processing industries to identify situations where diseases are major constraints on sweet corn production and to find solutions to those problems. Every major commercial sweet corn breeding program and sweet corn processing company in the United States cooperates in his research. As a first step, Pataky evaluates and classifies reactions of sweet corn hybrids to multiple diseases and uses complementary experiments on crop losses to relate yield reductions to threshold levels of disease. This information has been critical in identifying groups of sweet corn germ plasm for which improved levels of resistance or complementary control tactics are necessary. Researchers in the sweet corn seed industry have adopted various aspects of field methods and statistical procedures used by Pataky to categorize disease reactions of hybrids. Crop loss models developed by Pataky, his students, and colleagues have been used to establish threshold levels of control necessary to prevent yield losses caused by northern leaf blight, Stewart's bacterial wilt, common rust, *Maize dwarf mosaic virus*, and bacterial leaf blight. This information forms the foundation for evaluating disease-management decisions and control strategies, and it has helped establish goals for disease resistance breeding programs.

The second phase of Dr. Pataky's research involves the development of control tactics with an emphasis on disease resistance. Pataky has identified sources of resistance and helped develop elite sweet corn lines with resistance to common rust, Stewart's wilt, northern leaf blight, *Maize dwarf mosaic virus*, and seed-borne fungal infection of supersweet sweet corn. He has identified various sources of general rust resistance in sweet corn inbred germ plasm, has evaluated sources of *Rp* resistance against North American collections of *Puccinia sorghi*, and has been involved in the incorporation of this resistance into germ plasm used commercially. He also works cooperatively with scientists in the sweet corn industry to improve resistance through marker-assisted selection.

When levels of host resistance have been inadequate to prevent yield losses, Dr. Pataky has conducted epidemiological studies to help develop other control tactics. For example, studies on the temporal and spatial development of rust in resistant and susceptible genotypes, examination of incidence–severity relationships, and evaluation of the resistant reaction of adult leaves to rust have been used as the basis to develop strategies for efficient fungicidal control of this disease. Likewise, Pataky has defined situations in which seed-treatment insecticides are an economical method of controlling Stewart's wilt based on conclusions from studies on yield losses caused by Stewart's wilt, the use of seed-treatment insecticides to control the insect vector of *Erwinia stewartii*, and relationships between host resistance and incidence of systemic infection by *E. stewartii*.

Dr. Pataky's expertise is sought frequently by the sweet corn industry and by colleagues in academia. Early in his career, he was elected vice president and president of the National Sweet Corn Breeders Association, which enhanced his rapport with scientists in the sweet corn industry. In 1994, he worked with groups in the sweet corn seed industry to identify production problems in Japan. He also accompanied sweet corn industry representatives to Europe in 2000 to identify important sweet corn diseases and to speak about sweet corn disease control at a conference of vegetable food processors from Europe and Israel. Although he does not have an extension appointment, Pataky frequently is an invited speaker at industry-sponsored and extension conferences where the practical applications of his research are disseminated to sweet corn producers throughout North America.

Among his colleagues, Dr. Pataky is well known for his demanding work ethic. His field research program typically consists of 25,000 to 35,000 rows of trials that include 50 to 60 different projects on six to ten different diseases each year. His cooperative projects have included field experiments in ten different states and seven countries. During the growing season, Pataky usually can be found in field plots working with a crew of undergraduate and graduate students. Dr. Pataky sets high standards for himself and his students, and as such, he serves as an excellent role model for faculty and students alike.

Dr. Pataky's previous experience in communications also has been valuable. Colleagues frequently seek his assistance with editorial tasks, and he serves as a peer reviewer for various refereed journals. His editorial skills have been useful during his terms as an associate editor of *Phytopathology* and an associate editor and a senior editor of *Plant Disease*. He currently serves as a senior editor of *Plant Health Progress* and has served APS on the Germ Plasm and Collections, Host Plant Resistance, Illustrations of Plant Pathogens and Diseases, and Epidemiology Committees. For his pragmatic achievements in research and his dedicated service to APS and the sweet corn industry, Dr. Pataky is recognized as a worthy recipient of the Fellow Award.

Christopher Lewis Schardl

Christopher Lewis Schardl was born in Oxford, England, of American parents on July 31, 1957. Growing up, he resided in several locations in the United States and Canada. He earned his B.S. degree in biochemistry, with distinction, from Cornell University in 1978. He received his Ph.D. degree in biochemistry from the University of California, Davis, in 1983, having conducted his dissertation research with Clarence Kado on *Agrobacterium tumefaciens*. Dr. Schardl then spent two years studying maize mitochondrial genetics with David Lonsdale and Richard Flavell as a postdoctoral scholar at the Plant Breeding Institute in Cambridge, England. Dr. Schardl became an assistant professor in plant pathology at the University of Kentucky in 1985, having been hired as the department's first bona fide molecular biologist. He was charged with bringing genetic and molecular skills to bear while developing major research and instructional efforts in the area of plant–parasite interactions. These goals were accomplished in exceptional fashion, and Dr. Schardl was promoted to associate professor, with tenure, in 1991 and to professor in 1997. In 1988, Dr. Schardl's accomplishments were already such that he received a three-year Special Faculty Grant (developed as a recognition-of-excellence award) from the University President David Roselle. A particular highlight of Professor Schardl's early years at the University of Kentucky was his receipt, in 1989, of a McKnight Award for Individual Research Projects in Plant Biology. The McKnight Foundation provided grants to only ten outstanding scientists across the nation conducting basic research in plant biology as it relates to agriculture. The intent was to support gifted individuals who had conducted research for two to six years while promoting new initiatives in plant biology. This national recognition of Professor Schardl's remarkable research talents, which entailed a three-year, $105,000 grant, underscored his distinction as an exceptional junior member of the faculty. In 1992 and 1993, the National Science Foundation, through its international program, supported Dr. Schardl for a sabbatical in New Zealand, spent with Barry Scott at Massey University and Garry Latch at the AgResearch Grasslands Institute in Palmerston North. In 2001, Dr. Schardl was appointed to the first endowed chair in the plant pathology department, namely the Harry E. Wheeler Chair in Plant Mycology.

Although Dr. Schardl has applied his molecular skills and analytical mind to legume–*Fusarium*, tobacco blue mold, and other pathosystems, the fungal endophytes of pasture grasses have become his forte. His profound contributions to this latter research area have made him an international authority—indeed, a world leader on the molecular genetics and evolution of these fungal endophytes. The endophytic fungal symbionts confer apparent ecological advantages to their host grasses, enhancing pest resistance, drought tolerance, nutrient acquisition, and plant growth. To the farmer, however, there are disadvantages, since livestock grazing endophyte-infected grass suffer seasonal toxicoses that are a major economic detriment. Dr. Schardl accepted the dual challenges of elucidating fundamental biological interactions between endophyte and host and of attempting to modify the interactions so as to retain their advantages to the grass host while diminishing or abolishing the deleterious consequences to large animal herbivores. These issues represent major intellectual puzzles, and their resolutions will reap substantial practical benefit. National agencies, research foundations, and corporate support have consistently funded Dr. Schardl's research. The business sector is interested in utilizing endophytes for crop-improvement purposes, since the endophytes confer advantages to the durability of grasses used in pasture, soil conservation, mine reclamation, and turf. Over the years, Dr. Schardl has become the hub around which a variety of research endeavors have developed. Visiting scholars from other parts of the United States as well as Switzerland, Germany, and New Zealand have sought out Dr. Schardl's laboratory to enhance their expertise. Grass endophytes have long been within the purview of plant pathology because of their production of mycotoxins, which affect livestock, and their abilities to combat insects, nematodes, and some fungal pathogens. Furthermore, Dr. Schardl has documented the relationships of these symbionts with agents of "grass choke disease" and ergot, and in doing so, he has provided the most extensive documentation of evolution from plant pathogen to mutualist. He has demonstrated a key role in this process for interspecific hybridization, a previously under-appreciated phenomenon in fungi.

Recognition of Dr. Schardl's standing among fungal molecular geneticists is substantial and is reflected not only in the many grants he has received, but also in numerous invited review articles and many invitations to speak at national and international conferences.

Dr. Schardl has published his research findings widely in refereed journals. Several articles have appeared in such prestigious journals as the *Proceedings of the National Academy of Sciences of the USA*, *Nature*, *Genetics*, and *Cell*. Dr. Schardl's publications, then, are not only considerable in number but, more noteworthy, are of the highest scientific caliber. Particular note should be made of his sole authorship of a chapter in the 1997 *Annual Review of Phytopathology*. Dr. Schardl served as a panel member for the USDA's National Research Initiative Competitive Grants program in 1995 and 1999, USDA-IFAFS in 2000, and USDA-SBIR in 2001, and on an NSF panel in 1999. He has served, or continues to serve, as an associate editor for three journals: *Phytopathology*, *Mycologia*, and *Fungal Genetics and Biology*.

Dr. Schardl has been an active member of APS. In addition to serving as an associate editor of *Phytopathology*, he has been a member of the following committees: Phyllosphere Microbiology; Biochemistry, Physiology, and Molecular Biology; and Biotechnology Regulation Impact Assessment. He has given three invited talks and two workshop presentations at APS annual meetings. Furthermore, his graduate and postdoctoral students have consistently participated in APS annual and regional meetings, where they have made a total of 23 presentations since 1987. Dr. Schardl has also contributed substantial support to the Mycological Society of America's activities, serving as a councilor for molecular biology and on its Long-Term Planning Committee.

Carol E. Windels

Carol E. Windels grew up on a crop and livestock farm near Long Prairie, Minnesota. She obtained her B.A. degree in biology from St. Cloud State College and M.S. and Ph.D. degrees in plant pathology from the University of Minnesota. From 1980 to 1984, she was a scientist in the Department of Plant Pathology, University of Minnesota, and was appointed assistant professor of plant pathology at the University of Minnesota Northwest Research and Outreach Center, Crookston. She was promoted to associate professor in 1989 and full professor in 1998 and is an adjunct professor of plant pathology at North Dakota State University.

Dr. Windels has had an exemplary career through her leadership roles in The American Phytopathological Society and through her research on the etiology and ecology of root-infecting fungi on sugar beet and grain crops, primarily in the Red River Valley of Minnesota and North Dakota.

Dr. Windels served with distinction as president of The American Phytopathological Society in 1999 after having served as secretary-treasurer of the North Central Division and councilor-at-large of APS. She has served as chair of nine APS committees, as a member of 20 other committees, and as vice-chair of the APS Foundation. Her contributions in editorial service include associate editorships of *Phytopathology*, the *Canadian Journal of Plant Pathology*, and the *Journal of Sugar Beet Research*. Among the awards that Dr. Windels has received are the Distinguished Service Award from the North Central Division of APS and the Sugar Beet Distinguished Service Award from the Sugar Beet Industry of Minnesota and North Dakota.

Dr. Windels's research program has focused on the etiology and ecology of the soilborne pathogens of sugar beet, *Rhizoctonia solani*, *Aphanomyces cochlioides*, and *Pythium* species. She determined that root age was a factor in establishment of *R. solani* in roots, and moreover, that there was a greater diversity of anastomosis groups (AG) 1, 2, 4, and 5 in seedlings but the predominant group in older roots was AG2-2. Later she reported that AG2-2 isolates were also root pathogens of various bean crops grown in rotation with sugar beet in the Red River Valley. Her research with *A. cochlioides* has involved phenotypic variation and molecular studies on genetic variation within the pathogen population and evaluation of sugar beet germ plasm for resistance to root rot. The goal of the latter research was to assist the sugar beet industry in the development of resistant cultivars. She also has been involved in testing and registration of the fungicide Tachigaren (hymexazol) for control of Aphanomyces damping-off. Current research is exploring stress factors that reduce oospore survival. Various species of *Pythium* also are involved in the root rot complex in sugar beet. She spent a sabbatical leave studying *Pythium* taxonomy with Dr. Michael Stanghellini. With this background, she developed considerable expertise in species identification.

With coworkers, Dr. Windels documented that survival of species and varieties of *Fusarium* in soil was affected by corn culture. She determined that colony number and ecotypes of *F. graminearum* were changed by cropping of corn, when corn fields were compared with contiguous prairie. Moreover, *Fusarium* species survive in corn debris in soil and compete with other soil fungi in the selection for pathogenic ecotypes. With associates, she ascertained that organisms applied to crop seeds become established by physical occupation of the substrate, by the production of antibiotics, or by both.

Dr. Windels was the first to report *Gibberella fujikuroi* var. *subglutinans* in Minnesota soil. With mycotoxicologists, she reported no correlation of perithecial formation with zearalenone production in Group 1 and Group 2 isolates of *F. graminearum* pathogenic to corn and small grains. She also reported the dispersal of spores of *Fusarium* species by picnic beetles in corn fields.

Dr. Windels has a well-rounded program of service to the university, agriculture, and The American Phytopathological Society, and she has fostered teamwork in reaching goals. In all her efforts, she has commanded profound respect from her peers and coworkers for her integrity, her high stands of performance, her dedication to goals and to her associates, and to her congeniality in academic and professional environments. She is eminently worthy of being honored with the Fellow Award.

Noel T. Keen Award for Research Excellence in Molecular Plant Pathology

This award recognizes individuals who have made outstanding contributions in host–pathogen interactions, plant pathogens or plant-associated microbes, or molecular biology of disease development or defense mechanisms.

Alan Collmer

Alan Collmer was born and raised in rural Upper Bucks County, Pennsylvania. He received a B.A. degree in biology from Antioch College in Yellow Springs, Ohio, in 1973. After graduation, he worked as a research technician at the Charles F. Kettering Research Laboratories for two years. In 1975, he began graduate studies at Cornell University, where he studied extracellular pectate lyases produced by *Erwinia chrysanthemi*. He received his Ph.D. degree in plant pathology in 1981 and spent one additional year at Cornell as a postdoctoral associate in the section of biochemistry, molecular and cell biology, where he cloned the first cellulase gene from a thermophilic actinomycete in the laboratory of D. B. Wilson. In 1982, Dr. Collmer joined the Department of Botany at the University of Maryland as an assistant professor, where he continued research on pectolytic enzymes and pathogenesis of *E. chrysanthemi* and initiated studies on pathogenesis of *Pseudomonas syringae*. He returned to Cornell University as an associate professor of plant pathology in 1988 and was subsequently promoted to professor in 1994. It is important to recognize that, as the first recipient of the Noel T. Keen Award for Research Excellence in Molecular Plant Pathology, Dr. Collmer represents a generation of molecular plant pathologists whose careers thrived because of Dr. Keen's example and his generosity in relationships that ranged from competitor to collaborator to mentor.

Dr. Collmer's start in molecular plant pathology began in the laboratory of D. F. Bateman at Cornell University, where he studied the regulation of pectate lyase and exopolygalacturonosidase genes in *E. chrysanthemi*. This early work contributed significantly to our understanding of the regulation of virulence genes in plant-pathogenic bacteria and to the characterization of a number of genes that encode pectic enzymes. Later, he developed novel mutagenesis procedures to create mutants of *E. chrysanthemi* that lack all of the major pectate lyases, which led to the discovery of a set of secondary pectate lyases in this bacterium. These landmark studies demonstrated the multifactorial nature of virulence and how several pectate lyases contributed incrementally to bacterial soft rot disease. During this period, he coauthored with Dr. Keen a highly cited review on the role of pectic enzymes in plant pathogenesis. His research on pathogenesis of *E. chrysanthemi* represented one of the first examples in which molecular tools developed in the late 1970s and early 1980s were applied to bacterial plant pathogens.

After relocating his laboratory to Cornell University, Dr. Collmer's research interests shifted to include not only extracellular virulence proteins, but also protein secretion systems that confer the ability of a pathogen to traffic virulence proteins to plant tissues or the plant cell. In an important advance, his group cloned a functional cluster of "*out*" genes from *E. chrysanthemi*, which enabled *Escherichia coli* K12 to secrete pectate lyases and other related virulence proteins. Subsequently, it was demonstrated that this system was part of an emerging family of secretion systems in gram-negative bacteria, now designated type II secretion systems, which are often utilized by pathogens to secrete degradative enzymes in host tissues. His further analysis of *Erwinia out* and *pel* genes, in collaboration with Dr. Keen, identified components of the system implicated in controlling species-specific secretion in type II systems.

The growing interest of Dr. Collmer's group in the bacterial signals or elicitors of *P. syringae* that allow the bacterium to produce a hypersensitive response (HR) in resistant plants led to the cloning of a functional cluster of *hrp* (hypersensitive response and pathogenicity) genes that conferred to *E. coli* the ability to elicit the HR. His research established that *P. syringae hrp* genes encode a protein secretion system similar to protein secretion systems in animal pathogens, which became known as the type III secretion system (TTSS). His group also demonstrated the first protein, called harpin, to be secreted via a TTSS of a plant pathogen. Subsequently, this work was extended to include avirulence proteins encoded by *avr* genes and led to compelling evidence that a test Avr protein was delivered into plant cells by the TTSS. This had a major impact on phytobacteriology, because it linked the *hrp* and *avr* research systems with governing roles in eliciting an HR in resistant plants. A 1996 *Plant Cell* review article by J. R. Alfano and Dr. Collmer proposed a new model for bacterial plant pathogenesis, in which the central event in pathogenesis is the TTSS-mediated injection of Avr-like effector proteins into plant cells, such that inside plant cells these proteins collectively promote virulence unless the presence of any one of them is recognized by R proteins that trigger plant defenses. This model focused the puzzle of bacterial plant parasitism on the identity and function of TTSS effector proteins.

Because of the importance of genomics approaches in the identification of TTSS effector genes, perhaps the largest impact that Dr. Collmer has had on molecular plant pathology occurred in 2003 with the complete sequencing of the 6.5-Mb genome of *P. syringae* pv. *tomato* DC3000 through a multi-institutional National Science Foundation Plant Genome Research Program project that he directed. DC3000 is a model pathogen of both tomato and Arabidopsis, and by using a mix of experimental and bioinformatic tools, Dr. Collmer and his collaborators have substantially enlarged the inventory of type III effectors demonstrated to travel the *P. syringae* TTSS, making this inventory the largest for any bacterial pathogen of plants or animals.

Dr. Collmer was named a Fellow of The American Phytopathological Society in 1996 and a Fellow of the American Academy of Microbiology in 2000. He is recognized for valuable service to his profession, including serving on the editorial boards of the *Journal of Bacteriology*, *Annual Review of Phytopathology*, and *Plant Cell*; as an associate editor for *Molecular Plant-Microbe Interactions*; as panel manager for the USDA Competitive Grants Office; and as a board member of the International Society for Molecular Plant-Microbe Interactions. At Cornell University, he has served on numerous departmental and university committees. He guided the research and academic programs of a long list of graduate students and postdoctoral associates, who have now established distinguished research programs of their own.

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.

Laurence (Larry) V. Madden

Laurence (Larry) V. Madden was born in Ashland, Pennsylvania. He received his B.S. degree in 1975, M.S. degree in 1977, and Ph.D. degree in 1980, all from The Pennsylvania State University. He joined the Department of Plant Pathology at The Ohio State University (Wooster) in 1980 as a senior researcher. He became a faculty member in 1983 and was promoted to professor in 1990.

Dr. Madden is widely recognized as a leading international authority on botanical epidemiology who has made numerous seminal research contributions that have substantially increased our understanding of epidemics. He pioneered the use of many modeling approaches to analyze, compare, and understand the spatial and temporal components of plant disease epidemics. He has used knowledge gained from these advances to predict the risk of disease outbreaks and rates of disease increase based on population-dynamic principles and to develop efficient disease-management strategies. His research has directly affected individuals around the world who work to quantify and understand plant epidemics.

Of great significance in his early work are the development and interpretation of flexible differential-equation-based nonlinear models for describing disease development in plant populations and the evaluation of proper statistical methods for estimating and comparing model parameters. Continuing the research to this day, he recently developed with colleagues a coupled differential-equation model that directly links the population dynamics of insect vectors with the temporal progression of plant viral diseases. Because of the high complexity of plant virus systems, involving interactions of plants, insect vectors, and viruses, developing a strategic model previously was considered too difficult. In this landmark contribution, the basic reproductive number (R_0) for predicting invasion and persistence of plant viruses was derived heuristically and mathematically. He showed that there are profound differences in disease development for the four transmission classes of viruses with insect vectors (nonpersistent, semipersistent, circulative, and propagative). He and Frank van den Bosch recently extended this research by developing a model for any plant pathogen infecting annual crops that explicitly accounts for disease development within seasons and pathogen survival between seasons. A new R_0 was derived that can be used to predict disease invasion and persistence for introduced pathogens.

Through Madden's research, our understanding of the spatial component of plant epidemics has been dramatically increased. He has demonstrated the dynamic and predictable change of disease aggregation over time in fields and was the first to characterize this dynamic process using spatiotemporal autoregressive moving-average (STARIMA) models. Madden's recent research on the spatial heterogeneity of plant disease incidence has altered how plant pathologists assess aggregation of incidence. By focusing on the small-scale properties of pattern, he and Gareth Hughes developed the "binary power law" to characterize the spatial heterogeneity of disease incidence and showed that diseased plants follow a beta-binomial distribution as a consequence of the binary power law. The research has shown that much of the previously published work on distributions of plant disease incidence was either misleading or incorrect. This pioneering research has led to new concepts of the spatiotemporal processes inherent in botanical epidemics. The work has also led to the development of revised methods of sampling for disease incidence; determining the effects of experimental treatments on disease incidence, through the innovative use of generalized linear and generalized linear mixed models; and predicting disease dynamics at multiple scales in a spatial hierarchy (such as leaves and plants).

For more than 15 years, Madden has been conducting groundbreaking research on rain-splash dispersal of plant pathogens. He has characterized the physics of entrainment of spores into splash droplets and the relations between properties of impacting raindrops and resulting trajectories of splash droplets, showed the short trajectories of droplets, demonstrated the pronounced effect of surface topography and plant canopy structure on the biophysical aspects of dispersal, and demonstrated that rains of extremely short duration are sufficient for spore dispersal and plant infection. Of great significance is his work showing that rain intensity, the fundamental summary parameter for rain, affects spore dispersal in more complicated ways than considered previously. In a recent fundamental contribution to biomathematics, he and colleagues developed a model for spore transport across a surface in relation to rain intensity, topography, and other factors.

Dr. Madden has dramatically improved our understanding of the relationship between disease intensity and yield loss at the plant population level and has given a sound set of statistical protocols for analyzing and modeling crop losses. Most recently, he showed how to link disease progress and spatial heterogeneity models to models for yield as a function of "time of individual plant infection" and implemented new methodology for validating crop loss and other epidemiological models.

Madden has always been able to combine basic research on the mathematical and statistical aspects of botanical epidemics with more applied studies to solve practical problems. His early disease forecasting model for tomato early blight is the original basis for TOMCAST, a system for tomato disease management that has resulted in annual savings of millions of dollars. His recent work on rain splash has shown how the proper use of straw mulch (or other ground cover) can greatly decrease the incidence of diseases caused by splash-dispersed spores. He also has conducted field and laboratory studies to either develop forecasting systems or predict the risk of disease under various conditions.

Madden's research has been extremely productive. He has authored or coauthored more than 150 refereed papers, 24 book chapters, and one book and is in great demand as a lecturer nationally and internationally. Recently, he has taken a leading role in addressing the threat of bioterrorism to U.S. crops and making proposals for better response plans to attack.

Dr. Madden has a long history of distinguished service to his profession. He served as editor-in-chief of *Phytopathology* from 1991 to 1993 and was president of APS from 1996 to 1997. He has received many honors in recognition of his accomplishments. He received the Ciba-Geigy Award from APS, the Distinguished Senior Research Award from Ohio State's College of Agriculture, and The Ohio State University Distinguished Scholar Award. He is an elected Fellow of three scientific societies.

Lee M. Hutchins Award

This award is given 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).

Harald Scherm

Harald Scherm was born and raised on a farm near Kulmbach, Germany. He earned an undergraduate degree in agricultural sciences from the Technical University of Munich in 1990 and a Ph.D. degree in plant pathology from the University of California, Davis, in 1994. Following postdoctoral work at Iowa State University, he joined the Department of Plant Pathology at the University of Georgia, Athens, in 1996, where he is currently an associate professor.

Dr. Scherm's research is on pathogen biology and disease management in fruit crops. A major thrust has been on mummy berry disease of blueberry, caused by the fungus *Monilinia vaccinii-corymbosi.* To improve disease control, he and his students and postdoctoral associates investigated inoculum dynamics and disease development and management in relation to host phenology and environment. In addition, postharvest studies were conducted to improve detection of infected fruit in packinghouses. More basic research focused on interactions between conidia, pollen, and the pistil of open flowers where secondary infection occurs. These investigations have resulted in a series of seven publications in *Phytopathology* and *Plant Disease* between 2000 and 2002.

Field observations revealed that many blueberry plantings with a high incidence of fruit mummification at harvest in early summer harbor very low densities of pseudosclerotia on the ground in late fall, suggesting that oversummer survival is surprisingly low. Results of laboratory and field experiments indicated that survival was related primarily to maturity of pseudosclerotia at the time of fruit drop in early summer and was greatest for pseudosclerotia containing mature entostroma. Since the proportion of mature entostroma in infected fruit at fruit drop can vary considerably among southern blueberry cultivars, there may be cultivar-related differences in survival among cultivars that show similar levels of fruit infection. Further research revealed that survival and performance of pseudosclerotia could be reduced by application of fertilizer and commonly used herbicides. Experiments with mechanical cultivation showed that single passes with commonly used tillage implements can reduce apothecial emergence from pseudosclerotia by about 50%. This conclusion was based on results obtained in simulated field conditions and on commercial farms combined with a mathematical risk assessment model. Simulations with this model suggest that more effective risk reductions may be obtained by multiple cultivation passes that result in deep burial of pseudosclerotia combined with shallow tillage near the plant rows where most pseudosclerotia are located. This risk assessment approach provides a novel way of evaluating the effect of tillage practices on sclerotial pathogens.

The timing of apothecium emergence from pseudosclerotia is a critical event in the mummy berry disease cycle. In developing a temperature-based model for apothecium emergence, Dr. Scherm found that only a minimal amount of wintertime chilling was needed for development of viable apothecia, indicating effective adaptation of the pathogen to the low-chill environment of Georgia. There was a negative relationship between the number of chill-hours received and the number of degree-days needed for apothecium production. Thus, pseudosclerotia are well adapted to form apothecia following cold winters (high chill-hours, low degree-days) as well as warm winters (low chill-hours, high degree-days). Based on these results, Dr. Scherm developed a model to predict apothecium emergence by simultaneously monitoring chill-hour and degree-day accumulation during the winter. This model is being evaluated to improve scouting programs and more accurately target management of primary infection.

Knowledge of dispersal patterns of ascospores and conidia is important for assessing the risk of infection from nearby infested blueberry plantings or wild *Vaccinium* species. Dr. Scherm's research group recorded gradients of primary and secondary infection from inoculum point sources to understand the contribution to disease spread by different dispersal mechanisms and determine the potential for long-distance spread. As expected, primary infection gradients were longer downwind than upwind, demonstrating the dominant role of wind for ascospore dispersal. However, secondary infection gradients were longer upwind, suggesting that factors other than wind are important in conidial dispersal. This could include dispersal by bees, which have been shown previously to harbor conidia of *M. vaccinii-corymbosi*. A key role of pollinators in conidial dispersal, along with evidence for upwind foraging preferences of bees, could explain these longer upwind gradients.

M. vaccinii-corymbosi is one of the few fungal plant pathogens capable of infecting open flowers via the gynoecial pathway. Innovative research in Dr. Scherm's laboratory documented that both flower age and the timing and sequence of inoculation and pollination affect infection. Infection decreased significantly with flower age and by application of pollen at least one day before inoculation. Stigmatic xudates from blueberry flowers was shown to strongly enhance conidial germination. The extent to which conidia–pistil interactions during flower infection mimic processes that occur during pollination and fertilization is currently under investigation.

Mechanical harvesting and sorting procedures do not effectively separate infected from healthy fruit. Because of a near-zero tolerance for mummified fruit, fruit loads harboring even low numbers of pseudosclerotia are appraised at lower quality grades, resulting in severe economic penalties to producers. To improve estimates of disease incidence in fruit loads, a new method to detect and enumerate pseudosclerotia was evaluated. The method consisted of visual symptom assessment of intact fruit using a comprehensive pictorial key describing symptoms. This method was considerably more accurate and precise compared with previous methods. In addition, a sequential sampling plan was derived to calculate the minimum number of samples needed to accurately determine disease incidence with minimum expenditure of time.

Dr. Scherm has served as an associate editor for *Phytopathology* and *Plant Disease* and is presently a senior editor of *Phytopathology*. He has also served as a member of several committees of APS and as a panel member or reviewer for several national and international grant programs. In addition, he currently teaches an undergraduate course in introductory plant pathology and a graduate course in advanced disease management. Dr. Scherm's productivity, the significance of his publications, and his society contributions well qualify him as this year's recipient of the Lee M. Hutchins Award.

Excellence in Extension Award

This award recognizes excellence in extension plant pathology.

Edward A. Brown

Edward A. Brown was born on November 12, 1948, in Bremerhaven, Germany. He received his B.S. degree in general agriculture in 1972 and M.S. and Ph.D. degrees in plant pathology in 1975 and 1979, respectively, from the University of Georgia. Dr. Brown organized the first formal extension plant disease clinic at the University of Georgia and was a diagnostician from 1975 to 1979. He accepted a faculty position with the University of Georgia as an extension plant pathologist for turf, forestry, and shade trees in 1979. He was Georgia Extension Program Coordinator for Plant Pathology from 1991 to 2001. Dr. Brown retired October 2001 as professor emeritus.

Dr. Brown established a nationally respected outreach program on diseases in turf and forestry/shade trees. He made major contributions to the health of Georgia's trees and was instrumental in developing educational materials and executing Dutch elm disease control program standards for the United States and Georgia's principal cities. His work in confirming the presence of dogwood anthracnose in Georgia and his invitation from the U.S. Forest Service to coauthor a publication on dogwood care and management led to the distribution of more than 500,000 copies of this publication throughout the East coast. He received the 1991 U.S. Forest Service Centennial Conservation Award for his contributions in dogwood anthracnose control.

There are an estimated 1.3 million acres of turf valued at $858 million with the economic revenues of the golf industry of $1.84 billion in Georgia. Dr. Brown has been extremely successful in evaluating research results and disease-control recommendations to reduce disease losses, while minimizing pesticide use to limit environmental impact. He has served as chair of the Turf Commodity Committee at the University of Georgia. He was chair of the 1996 Olympic Soccer Site Advisory Committee that provided the United States and the world one of the best-ever world-class soccer facilities. Dr. Brown is an active member of the Program Committee of the Georgia Golf Course Superintendents Association and also serves as Green Section Committee member of the United States Golf Association and advisor to the Augusta National Golf Club Masters Tournament.

Dr. Brown has served on the National Initiative Committee for Georgia in food quality and safety as well as water quality. He chaired the Georgia Pesticide Use and Safety Committee and developed a water-quality exhibit that won national recognition as the Educational Water Quality Effort for 1995 by the American Society of Agronomy.

Dr. Brown coordinated the first Pesticide Container Recycling Program in Georgia in 1992, which has become a significant annual educational effort involving 60 counties, resulting in more than 250 tons of containers being chipped in 1999. This effort was the catalyst for Dr. Brown to organize and promote the Georgia Clean Day Program with the Georgia Department of Agriculture to collect canceled or suspended pesticides from farms in Georgia. This effort has resulted in the disposal of 100 tons of agricultural canceled or suspended pesticides from Georgia counties since 1994. Today, the Georgia Legislature funds both these efforts. He served on the Pesticide Applicator Steering Committee and Endangered Species Committee for Georgia and has done extensive work with Georgia's 4-H Long Range Advisory Committee. He has served on the Georgia Extension Publications Task Force and on the Extension Publications Review Committee and served for three years on the Affirmative Action Review Team for the Georgia Cooperative Extension Service. Dr. Brown served as president, vice president, and secretary/treasurer of the Georgia Association of Plant Pathologists and on the board of directors and chair of the State Membership Committee of the Georgia Association of County Agricultural Agents. Dr. Brown served as advisor to the Agricultural Chemicals Association of Georgia and advisor to the Georgia Crop Improvement Association.

Because of Dr. Brown's dedication to agriculture, he chaired the College of Agriculture and Environmental Sciences Unity Tour Committee to acquaint new faculty with the breadth of agriculture in Georgia and how the college integrates its academic and extension programs to support and impact agriculture.

Dr. Brown was chair of the APS Illustrations of Plant Pathogens Committee and served as a senior editor of APS PRESS from 1989 to 1992. His interest in creative education techniques has led him to acquire funding of $1,000,000 to develop Distance Diagnostics Through Digital Imaging in Georgia. He established 60 diagnostic imaging sites in county extension offices with microscopes, dedicated computers, and disease diagnostic literature to deliver grass roots-generated plant pathology education to improve the profitability and sustainability of agriculture. This database programming and technology has been deployed in Texas through Texas A&M, Illinois through the University of Illinois at Urbana/Champaign, Alabama through Auburn University, Louisiana through Louisiana State University, and Hawaii through the University of Hawaii. He continues to be instrumental in the development of the Center for Internet Imaging and Database Systems, which employs a project manager and three dedicated full-time programmers.

Dr. Brown has conducted more than 550 conferences, workshops, seminars, and training sessions, where more than 516,000 people have been taught the latest methods of disease diagnostics and control. In addition, he has authored more than 132 publications and has been an invited lecturer 35 times in 13 states.

Dr. Brown received the Achievement Award from the Georgia County Agricultural Agents Association in 1987 and 1989. In 1994, he received the Distinguished Service Award from The National Association of County Agricultural Agents and Georgia Agricultural County Agents Association and chaired the Education Committee for the 2002 National Association of County Agricultural Agents Annual Meeting.

In 1992, the University of Georgia recognized Dr. Brown's contributions in public service programming by awarding him the Walter B. Hill Distinguished Service Award. That same year, he was recognized with the highest award the university can bestow on a public service faculty member, Walter B. Hill Distinguished Service Fellow, equivalent to distinguished professor. In 1999, Dr. Brown was awarded the University of Georgia Agricultural Alumni Award for Excellence. He also received the Georgia Golf Course Superintendent Association's Distinguished Service Award and the Georgia Turfgrass Association's Lifetime Achievement Award in 2001.

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.

Chester L. Sutula

Chester L. Sutula, a native of Erie, Pennsylvania, obtained his B.S. degree in chemistry from Holy Cross College in 1954 and his Ph.D. degree in physical chemistry from Iowa State University in 1959. After working for Marathon Oil Company for eight years in surface chemistry and oil production research, he joined Ames Company, a division of Miles Laboratories, Inc., in 1967 and became its director of research in 1970. In 1976, he joined Ortho Diagnostics Systems, a division of Johnson & Johnson, Inc., as vice president of R&D.

In 1981, Dr. Sutula established Agdia, Inc., Elkhart, Indiana, to develop and provide reliable and practical diagnostics for the detection of plant pathogens. During this period, diagnostic assays based on the ELISA method were already being developed for human and veterinary applications. Following the reports of the first use of ELISA to detect plant viruses by Voller and Clarke, Dr. Sutula introduced the first commercial kits for the detection of potato viruses and bacteria. These kits provided all of the components that were necessary to perform the test in a ready-to-use format, called PathoScreen®. His initial vision was to develop these kits for growers, and he devoted much time and resources to visiting farmers and conducting hands-on workshops. He established collaborations with many plant pathologists, built the Agdia team, and expanded Agdia's product range to include many plant viral diagnostic kits.

From the very beginning, Agdia received an enthusiastic response from a rapidly growing number of customers, and soon the diagnostic kits were recognized worldwide for their quality and value. With two competing companies in Europe, Dr. Sutula pioneered the concept of "reagent sets"—matched, quality-controlled antibodies and antibody-enzyme conjugates that can be used to prepare and perform one's own test. He integrated these ideas into plant diagnostics, expanded the scope of diagnostic assays, and guided Agdia to an 80-fold sales growth over the past 21 years. In response to many requests, he formed Agdia Testing Services in 1982, a unit of Agdia that is known worldwide for its reliable, high-quality results and rapid, responsive, confidential service. Agdia is also known for its affordable, quality products and currently offers more than 200 tests that use several technologies, such as ELISA, PCR, nucleic acid hybridization, immunochromatography, and IFA, to detect viruses, viroids, bacteria, fungi, mycoplasma, insects, plant hormones, and proteins in conventional and genetically modified crops. Dr. Sutula's plan was to make research on detecting plant pathogens available to many persons in worldwide agriculture and to package this technology into easy-to-perform, affordable tests. Agdia's products now ship to more than 120 countries.

Dr. Sutula has served on several APS committees over the years, including the Industry, Virology, and Diagnostics Committees, and has been a reviewer for *Plant Disease*. He has authored several articles and many posters and presentations dealing with the detection of plant pathogens.

International Service Award

This award recognizes outstanding contributions to plant pathology by an APS member for a country other than their own.

Kitty Frances Cardwell

Kitty Frances Cardwell was born in Albuquerque, New Mexico, in 1953, and grew up in Georgetown, Texas. She got a B.A. degree in botanical sciences with a minor in chemistry from the University of Texas, Austin, in 1976. From 1976 to 1977, she attended graduate school at Texas A&M. She was a Peace Corps volunteer in Nicaragua from 1977 to 1978, serving as an extension plant pathologist with the Instituto Bienestar Agropecuario, a USAID-financed agricultural project for small-scale farmers. Because of the revolution, the Peace Corps relocated her to Colombia in 1978 to work as a research and extension plant pathologist on chemical controls of rice blast and sorghum anthracnose with the Instituto Colombiano Agropecuario.

During her Peace Corps travels, Dr. Cardwell met and married a Colombian farmer and from 1980 to 1985 was the phytosanitary manager of a 500-ha farm of upland rice. She was active in the farm community, the rice cooperative, and in assisting other farmers with disease diagnosis and control. She became a pivotal leader during an epidemic of hoja blanca, advising on vector control and crop management and finally serving as spokesperson for the Rice Federation.

In 1985, Dr. Cardwell returned to Texas A&M to complete her doctorate and worked with Professor R. A. Frederiksen on the population biology of *Colletotrichum graminicola*. She received a grant to assess virulence patterns on differential sorghum nurseries in Texas, Georgia, Puerto Rico, and Brazil. She developed an innovative statistical approach to minimize error in pathogen population assessment caused by host genotype–environment interactions that was reported in *Biometrics*.

In 1989, Dr. Cardwell became a plant pathologist and program leader for the International Institute of Tropical Agriculture (IITA) in Nigeria and worked on *Striga gesneriodes* across sub-Saharan West Africa. Dr. Cardwell was asked to develop and take the lead in IITA's multi-disciplinary *Striga* working group.

In 1991, Dr. Cardwell began focusing on a serious downy mildew problem on maize caused by *Peronosclerospora sorghi* in seven states of Nigeria and spreading rapidly westward toward Benin Republic. She organized funding with the Food and Agriculture Organization, the World Bank, and Ciba-Geigy for research and extension efforts, including disease screening and management strategies. Together with IITA and National Agricultural Research Maize Breeders, resistant cultivars were improved and deployed. A strategy to deploy mobile chemical seed-treatment equipment was developed. However, the loss of the chemical product in a maritime accident caused funding to be withdrawn. The *Wall Street Journal*'s report of this incident stimulated the World Bank to help with the distribution of downy mildew-resistant seed. A public awareness campaign on the cause and control of downy mildew was launched and reached 600,000 small-scale farms, and over a five-year period, the disease decreased from a chronic, endemic problem to a rare occurrence. The disease front was stopped 65 km from the Benin frontier. For this work, Dr. Cardwell was conferred an honorary fellowship of the Maize Association of Nigeria.

In 1993, Dr. Cardwell received funding from the German government to open a new laboratory in the IITA Centre for Biological Control in Benin dedicated to studies on mycotoxigenic fungi. From 1993 to 2001, she led a large multinational research program on *Aspergillus flavus* and *Fusarium verticillioides*. They discovered that a common African strain of *A. flavus* produces both B and G toxins, whereas new-world strains produce only B toxins. This information is being used to develop biocontrol options for *A. flavus* in West Africa in conjunction with Peter Cotty at the USDA-ARS in New Orleans. Based on agroecological data on the prevalence of *A. flavus* and aflatoxin collected across sub-Saharan Africa, Dr. Cardwell devised a research initiative to study the impact of aflatoxin on child health. A recent article in the *British Journal of Medicine* describes the severe effects of aflatoxin on child health and development. This study is ongoing with the Leeds School of Medicine and the London School of Tropical Hygiene and Medicine, with the support of the German Bundesministerium fuer wirtschaftliche Zusammenarbeit, Ministry of Agricultural Cooperation. This work explains the higher morbidity and mortality in Africa before the age of five compared with the rest of the world and leads the way to meaningful remediation of the impact of foodborne mycotoxins on the physical and economic well-being of millions of Africans. Dr. Cardwell engaged Rotary International in a public awareness campaign to teach people how to avoid the adverse effects of aflatoxin exposure. This effort is expected to change policy-level decision making, as well as the food-handling behavior and crop-management perceptions of millions of farmers in Ghana, Togo, and Benin.

Perhaps the most important aspect of Dr. Cardwell's contribution in Africa was graduate student training of numerous African and international scientists to meet the challenges of African agriculture. One aspect of this effort was the discovery of the interaction of *F. verticillioides* with Lepidopteran stem borers of maize, causing contamination with fumonisin and other toxins produced by this fungus. It was discovered that *F. verticillioides* is not only vectored by insects, but actively attracts them to the infected plants. This line of research has led to numerous publications and a legacy of collaboration across Africa.

Dr. Cardwell presently serves as the National Program Leader for Plant Pathology with the USDA-CSREES. She runs competitive grants programs on methyl bromide alternatives and citrus tristeza and is developing the National Plant Pest and Disease Diagnostic Network for homeland security. Dr. Cardwell recently was granted an embassy science fellowship, which in partnership with the State Department, took her to Costa Rica to work with the government of that country on understanding the U.S. guidelines and regulations concerning genetically modified crops and foods. Her diplomacy skills resulted in a very positive interaction with the Costa Rican technical ministries and advancement in understanding of the science-based thinking of the U.S. regulatory agencies.

Dr. Cardwell is a long-standing member of the APS Office of International Programs (OIP), for which she chairs the Education Committee and writes the OIP newsletter.

Syngenta Award

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

Sophien Kamoun

Sophien Kamoun received his Maitrise (B.S.) degree from Pierre and Marie Curie University, Paris, France, in 1987 and his Ph.D. degree in genetics in 1991 from the University of California, Davis, where he conducted his research in the Department of Plant Pathology. Following postdoctoral studies at the NSF Center for Engineering Plants for Resistance Against Pathogens at Davis and at the Department of Phytopathology, Wageningen University, The Netherlands, Dr. Kamoun joined the Department of Plant Pathology, Wooster campus, at The Ohio State University in 1998. His research program is focused on oomycete molecular genetics, and he was promoted to associate professor in 2002.

Dr. Kamoun has made outstanding contributions to the science of plant pathology that have been described in more than 50 journal articles and book chapters. His research at Ohio State is aimed at understanding the molecular basis of interactions between oomycete pathogens and plants. He has rapidly become a global leader on oomycete molecular genetics and genomics and has opened many new research fronts. He pioneered the study of nonhost resistance of *Nicotiana* and *Arabidopsis* to *Phytophthora infestans*. A major accomplishment included the cloning and characterization of a multigene family of *P. infestans* encoding extracellular elicitor proteins. These proteins, called elicitins, induce the hypersensitive response in some plant species, and he showed that recognition of the major elicitin, INF1, is a component of nonhost resistance. This work has greatly influenced many scientists working on the molecular genetics of *Phytophthora*–plant interactions and in basic studies on the hypersensitive response of plants.

Dr. Kamoun's laboratory has also been involved in pioneering studies in genomics and functional genomics of *Phytophthora*. In 1998, he published the first functional analysis of a *Phytophthora* gene, and his laboratory is performing similar gene silencing analyses with other putative avirulence/virulence genes. Recent contributions in functional genomics have revolved around developing data mining algorithms and high throughput functional assays that link sequences to phenotypes for *Phytophthora* genes and facilitate the discovery of novel *Phytophthora* effector proteins. Dr. Kamoun also pioneered the use of in planta functional analyses of *Phytophthora* genes using virus vectors. His research is currently supported by the NSF Plant Genome Program.

Dr. Kamoun's early research focused on genetic analysis of the pathogenicity of *Xanthomonas campestris* and included characterization of a pathogenicity locus of the *hrp* class, discovery of a phenotypic switching phenomenon, and the development of novel strategies for refined genetic manipulations of xanthomonads. Dr. Kamoun also was one of the first to recognize and classify races of the crucifer pathogen *X. campestris* pv. *campestris*. His knowledge and expertise is in much demand around the world. Over the years, he has offered more than 60 invited seminars and presentations at national and international venues, has served as a panel member in the USDA-NRI program, currently serves as a senior editor for *Molecular Plant Pathology*, as an associate editor for *Molecular Plant-Microbe Interactions*, and is on the advisory committee of the NSF Potato Genome Project and the NSF *Phytophthora* Collaboration Network. At Ohio State, he has organized two international workshops on oomycete genetics, and there is a steady stream of international scholars visiting his laboratory.

In addition to his research, Dr. Kamoun is highly committed to the education of students in the areas of genetics, molecular biology, and genomics. He and colleagues developed and co-teach two upper-level graduate courses at Ohio State: Agricultural Genomics—Principles and Applications and Plant–Microbe Interactions. Both courses aim at exposing students to modern research themes in these areas. In addition, he has organized and managed an interactive website for agricultural genomics that has been heavily used by students. Three of Dr. Kamoun's graduate students have won travel and research awards, including a first-place award for a research poster at the International Congress of Molecular Plant-Microbe Interactions in Madison, Wisconsin, in 2002.

Dr. Kamoun has a continuing interest in and commitment to training undergraduate and high school students from diverse backgrounds and in involving underrepresented groups in molecular plant pathology research. Several undergraduate interns from multiple institutions and students from Wooster High School have conducted internships in his laboratory and received training in molecular biology, plant biology, and bioinformatics. Undergraduate students have often coauthored his publications, and several have moved on to graduate studies. Dr. Kamoun also organizes a summer program, entitled Internships in Plant Immunity, that promotes the use of plant–microbe interaction systems in research and teaching at minority institutions. He serves on The Ohio State University College of Food, Agricultural, and Environmental Sciences Diversity Advisory Council and contributes to the outreach efforts of his department in the area of biotechnology education.