A Review of the Citrus Greening Research and Development Efforts Supported by the Citrus Research and Development Foundation: Fighting a Ravaging Disease

Committee

Jacqueline Fletcher

Chair

Dr. Jacqueline Fletcher is currently Regents Professor Emerita at the National Institute for Microbial Forensics and Food and Agricultural Biosecurity (NIMFFAB), Department of Entomology and Plant Pathology, Oklahoma State University (OSU), Stillwater, OK. Previously, she was the director of NIMFFAB (2007-2015), Sarkeys Distinguished Professor of Agricultural Science (2001-2008), professor (1992-2001), associate professor (1988-1992), and assistant professor (1983-1988) at OSU. Dr. Fletcher established a strong research program on the molecular biology, genetics, and host–pathogen interactions of phytopathogenic spiroplasmas and phytoplasmas at OSU. Her research team is recognized internationally for its contributions to the field of plant mycoplasmology, particularly on molecular determinants mediating transmission by insect vectors. Dr. Fletcher was also part of a team of USDA-ARS, Texas A&M University, and OSU scientists that worked on cucurbit yellow vine disease, a damaging cucurbit disorder in the midwest and east coast states that is caused by a phloem-inhabiting bacterium. She has also participated in several international research initiatives, such as the International Soybean Program in Mexico and Costa Rica, and has worked on sugarcane whiteleaf disease in Thailand, and on several phytoplasma diseases in Italy. Dr. Fletcher has been invited to speak at numerous national and international venues. She has also served on numerous panels and committees, including the USDA NIFA Departmental Review Panel: Department of Plant Pathology, University of Nebraska (2016); National Academies of Sciences, Engineering, and Medicine, Forum on Microbial Threats (2010-2016); AAAS Consortium of Affiliates for Security Policy (2010-2015); Biosurveillance Subject Matter Expert Panel, Defense Threat Reduction Agency/Los Alamos National Laboratory (2011-2012); USDA ARS NP 303 Research Plan Review Panel, Emerging Plant Diseases (Chair, 2011-2012); the National Research Council Committee on Global Science and Technology Strategies and Their Effect on U.S. National Security (2009-2010); and Inter-Agency Working Group on Citrus Variegated Chlorosis, APHIS Select Agent (2007-2008); Inter-Agency Working Group on Citrus Greening, APHIS Select Agent (2005-2006). Dr. Fletcher is on the editorial board of Frontiers in Microbial Forensics and was Senior Editor for the American Phytopathological Society (APS) Press and Associate Editor for Plant Disease. She has served as an ad hoc reviewer for agencies such as the National Environmental Research Council (Great Britain), the National Science Foundation, US National Park Service, and USDA NRI/NIFA and for numerous scientific journals including Applied and Environmental Microbiology, Journal of Bacteriology, Molecular Plant-Microbe Interactions, Phytopathology, and Proceedings of the National Academy of Sciences. Her honors and awards include the Plant Pathologist of Distinction award from APS (2016); OSU President’s Cup – Promoting Creative Interdisciplinary Competition Award (2012); Phoenix Award, Outstanding Graduate Faculty Educator from OSU (2011); and Sigma Xi Lectureship Award (2006). Dr. Fletcher is a member and a fellow of the American Association for the Advancement of Science and the APS. She served as the President of the APS from 2003 to 2004. She is also a member of the American Society for Microbiology, the International Organization for Mycoplasmology, Gamma Sigma Delta (National Agricultural Honor Society), American Women in Science, Oklahoma Academy of Science, and Sigma Xi. She received a B.S. in biology from Emory University in 1970, an M.S. in botany from the University of Montana in 1972, and a Ph.D. in plant pathology from Texas A&M University in 1979.

May R. Berenbaum

Member

Dr. May Berenbaum has been on the faculty of the Department of Entomology at the University of Illinois at Urbana-Champaign since 1980, serving as head since 1992 and as Swanlund Chair of Entomology since 1996. She is known for elucidating chemical mechanisms underlying interactions between insects and their host plants, including detoxification of natural and synthetic chemicals, and for applying ecological principles in developing sustainable management practices for natural and agricultural communities. Her research, supported primarily by NSF and USDA, has produced over 230 refereed scientific publications and 35 book chapters. She has authored numerous magazine articles and six books about insects for the general public. Dr. Berenbaum is a member of the National Academy of Sciences and has chaired two National Research Council committees, the Committee on the Future of Pesticides in U.S. Agriculture (2000) and the Committee on the Status of Pollinators in North America (2007). Her most recent awards and honors include Fellow, Entomological Society of America (2002); Entomological Society of America Distinguished Teaching Award (2006); Tyler Prize for Environmental Achievement (2011); Honorary Fellow, Royal Entomological Society (2012); Fellow, Ecological Society of America (2012); Entomological Foundation Medal of Honor (2014); 2012 National Medal of Science (2104); and John P. McGovern Science and Society Award, Sigma Xi (2015). She has been invited to speak at various symposia and conferences and has served as associate editor for Entomology, American Midland Naturalist; CRC Reviews in Plant-Insect Interactions; Evolution; Journal of Chemical Ecology; Chemoecology and as a reviewer for numerous scientific journals. She has also served as a program reviewer for the National Science Foundation, USDA, National Geographic Society, the National Institutes of Health, among others. She is a member of the American Association for the Advancement of Science; Sigma Xi; Entomological Society of America; Ecological Society of America; International Society for Chemical Ecology; Society for the Study of Evolution; Phytochemical Society of North America (invited member 1985-1995); Lepidopterists Society; and the American Institute of Biological Sciences. Dr. Berenbaum graduated summa cum laude, with a B.S. degree and honors in biology, from Yale University in 1975 and received a Ph.D. in ecology and evolutionary biology from Cornell University in 1980.

Stewart M. Gray

Member

Dr. Stewart Gray is a Senior Research Plant Pathologist with the USDA Agricultural Research Service (ARS) and holds a Courtesy appointment as Professor of Plant Pathology and Plant-Microbe Biology at Cornell University in Ithaca, NY. He received his MS in entomology and PhD in plant pathology, both from North Carolina State University. Since moving to Ithaca in 1987, his research has focused on understanding insect vector-virus-plant interactions, the genetics of vector competence in aphid populations, and biological and cultural factors that influence virus epidemics in cereal and potato crops. His long-term goal is to develop sustainable virus disease control practices based on cultural practices, various types of host plant resistance, and the interference of efficient transmission of viruses by their insect vectors. Dr. Gray is internationally recognized as an authority in the field of vector biology and plant virus epidemiology and has authored comprehensive and highly cited review papers on plant virus-aphid-plant interactions and virus disease management. Since 2002, he has worked closely with the US potato industry and USDA-APHIS to develop and implement National Harmonization Standards for the management of tuber necrotic viruses. He serves on the National Potato Council subcommittee for Seed Certification and Plant Disease Management and the North American Plant Protection Organization committee on potato diseases. He is the project leader for a national research program (2009-2019) on tuber necrotic viruses funded by USDA-ARS, USDA-NIFA, USDA-APHIS and the potato industry involving more than 30 investigators at 12 institutions. For his contributions to the potato industry, Dr. Gray was awarded the 2009 Meritorious Service Award by the National Potato Council and U.S. Seed Potato Growers. His other awards include being named a Fellow of the American Association for the Advancement of Science (2013) and the American Phytopathological Society (2014) and being recognized as the Senior Scientist of the Year (2013), USDA, ARS, North Atlantic Area. Dr. Gray has received more than $15 million in competitive funding, has published more than 110 refereed publications and book chapters, and has been invited to speak at more than 60 regional, national, and international meetings. He served as Senior Editor of Plant Disease (2007-2010), Senior Editor of Phytopathology (2015-2016), Associate Editor of Virology (1994–2000) and Associate Editor of Journal of General Virology (2010–2017).

Russell L. Groves

Member

Dr. Russell L. Groves currently serves as a vegetable extension specialist and professor in the Department of Entomology at the University of Wisconsin-Madison, where he also served as associate professor (2012-2016) and assistant professor (2006-2012). Prior to working at UW-Madison, he was a Research Entomologist at USDA-ARS, San Joaquin Valley Agricultural Sciences Center in Parlier,CA, where he worked on the bacterium Xylella fastidiosa and its insect vector, the glassy-winged sharpshooter. His extension and research program at UW-Madison is centered on the ecology and management of insects of commercial and fresh market vegetable crops. Among his recent awards are the UW ARS Researcher Award, University of Wisconsin, Agricultural Research Stations, College of Agricultural and Life Sciences (2015); Second Mile Award from the Wisconsin Association of County Agricultural Agents (2014); Glen Pound Extension Award from the College of Agricultural and Life Sciences (2013); American Society of Agronomy, Certificate of Excellence, 2013 Educational Materials Award; Outstanding National Extension Project Award (2011) from the Potato Association of America; and Researcher of the Year award from the Wisconsin Potato and Vegetable Growers Association (2009). Dr. Groves has served on the research board of several grower associations in Wisconsin. He has also served as grants reviewer for the Ecological Genomics Institute, Kansas State University (2008); the Citrus Research and Development Foundation (2010-2015); and the National Science Foundation (2009, 2012, 2013) and for several USDA NIFA grants programs including the Specialty Crop Research Initiative, Citrus Disease Research and Extension (2015) and the Special Grants Program, Citrus Tristeza Virus (2007). Dr. Groves served on the Frito-Lay North America Zebra Chip Technical Advisory Board (2006-2014), was the chair for the Frito-Lay Research Grant Panel (2006-2008), and was a reviewer for the grants program of the CDFA Pierce’s Disease Research and Control Program (2006-2015). He has been invited to give seminars at various universities and to speak at numerous conferences. He has published more than 50 peer-reviewed articles and more than 150 non-refereed/technical papers. Dr. Groves is a member of the Gamma Sigma Delta National Honor Society, the Phi Kappa Phi National Honor Society, the Entomological Society of America and the American Phytopathological Society. He holds an MS degree in entomology from the University of Arkansas and a PhD in entomology from North Carolina State University.

Ralph Scorza

Member

Dr. Ralph Scorza was employed by the USDA Agricultural Research Service as a Research Horticulturist and Lead Scientist from 1980 until his retirement in September 2016. He received his BS and MS degrees in agronomy and plant physiology, respectively, from the University of Florida, and received his PhD in plant genetics and breeding from Purdue University. His peach, nectarine, and plum breeding programs combined classical and molecular approaches to improve tree form, disease resistance, and fruit quality. Dr. Scorza led the development of the genetically engineered (GE) Plum pox virus resistant plum cultivar ‘HoneySweet’, which was the first GE temperate tree fruit approved for cultivation in the United States and the first crop of any kind to be approved for commercialization in the United States exhibiting RNAi-based genetic modification. Dr. Scorza currently leads an international team that is working to submit ‘HoneySweet’ for cultivation approval in the European Union. Dr. Scorza worked closely with the USDA-Foreign Agricultural Service to provide information and guidance on plant biotechnology regulation to government agencies in a number of countries including Bosnia-Herzegovina, Bulgaria, Chile, France, and Serbia. He is a co-developer of the ‘FasTrack’ breeding technology, a novel breeding approach that incorporates genetic engineering to reduce the time required for developing new fruit tree varieties by at least half. Using the products of ‘FasTrack’ technology he worked with NASA to adapt miniature and ever-fruiting plum trees for long distance space flight and for Mars colonization. Dr. Scorza is the recipient of the Flemming Award for "Exceptionally creative and useful research and leadership in the area of stone fruit breeding and genetics," a recipient of a USDA-ARS Senior Research Scientist of the Year Award, and has been co-recipient of three U.S. Secretary of Agriculture Honor Awards. He is a recipient of the USDA Foreign Agricultural Service Distinguished International Service Award and the U.S. National Peach Council Carroll R. Miller Award. He has developed and released 12 stone fruit cultivars that are currently marketed in the United States. Dr. Scorza is the co-inventor of 4 biotech patents, and authored over 200 research publications. He is a Fellow of the American Society for Horticultural Science and in 2015 he was honored by induction into the USDA Science Hall of Fame. Dr. Scorza is currently the principal of Ralph Scorza LLC, providing consultation services in plant biotechnology science, the regulation of the products of plant biotech, and in plant breeding and plant patenting.

Lindsay R. Triplett

Member

Dr. Triplett is the Primary Investigator and Assistant Agricultural Scientist II at the Jenkins-Waggoner Laboratory in the Department of Plant Pathology and Ecology at the Connecticut Agricultural Experiment Station. She studies the DNA sequences of plant-infecting bacteria to answer questions about their virulence mechanisms and phylogenetic diversity, and to develop diagnostic tools for disease detection. In the past, her research has characterized the molecular interactions between Xanthomonas oryzae and rice, focusing on resistance to a few secreted proteins that act as toxins or transcriptional activators. She is now continuing that line of research on other plant pathogenic Xanthomonas species that infect a variety of crops. Dr. Triplett is a member of the American Phytopathological Society and the American Society for Microbiology. She has also received many grants and awards, such as the American Phytopathological Society award for the “Face of the Future in Phytobacteriology.” Dr. Triplett received her B.A. in biology from Earlham College and Ph.D. in plant pathology from Michigan State University.

John Trumble

Member

Dr. John Trumble is currently a Distinguished Professor at the Department of Entomology, University of California, Riverside, where he also served as full professor (1990-2011), associate professor (1985-1990) and assistant professor (1980-1985). His current research covers both basic and applied problems in agricultural and natural ecosystems and includes the effects of air and water contaminants on plant-insect interactions, particularly how increasing concentrations of contaminants impact plant physiology and how any resulting chemical or growth changes may impact insect development and behavior. Dr. Trumble was previously engaged in zebra chip research and was co-director of the Zebra Chip Research Team, which was formed in 2005 to address the devastating effect of the zebra chip pathogen, Candidatus Liberibacter psyllaurous/solanacearum, on the potato industry. This research team received the Entomological Society of America (ESA) Integrated Pest Management Team Award in 2012 for developing techniques and strategies that helped control the disease. His recent honors and awards include the National Institute of Food and Agriculture Partnership Award for Mission Integration of Research, Extension, and Education (2014); the Oscar Lorenz Award (2013) from UC Davis Plant Sciences Department, in recognition of his meritorious service to the California vegetable industry; the Texas A&M Award in Excellence (2013); Plenary Speaker, International Congress on Climate Change (2009); the Outstanding Entomology Alumnus Award, Virginia Tech (2007); Team Leader, International team to evaluate Biosecurity and Applied Entomology in New Zealand (2007); and the ESA Research Recognition Award (2003). Dr. Trumble is a fellow of the American Association for the Advancement of Science and ESA. He is the Editor in Chief of the Journal of Economic Entomology (2001-present) and is a member of the editorial board of the Annual Review of Entomology (2000-present) and Insect Science (2002-present). He was an editor for the Annals of Applied Biology (2009-2015). Dr. Trumble has served on numerous grant panels, including those of NIH, EPA, and USDA NRI and has been invited to speak at more than 30 symposia and seminars since 2005. He has published more than 200 peer-reviewed journal articles and more than 100 technical publications. Dr. Trumble received an MS and a PhD in entomology from Virginia Tech in 1977 and 1980, respectively.

Bing Yang

Member

Dr. Yang is currently an Associate Professor with tenure of Development and Cell Biology at Iowa State University. His research focuses on the molecular mechanism of plant/microbe interactions and crop disease resistance engineering; and the development and application of TALEN (transcription activator-like effector nucleases) and CRISPR (clustered regularly interspaced short palindromic repeats) technologies for targeted genome editing in plant species. For the past 19 years, Dr. Yang has identified and characterized several important naturally-occurring TAL (transcription activator-like) effectors in the rice pathogen, Xanthomonas oryzae, for their disease-promoting ability and, most recently, he has helped harness the disease-causing TAL effectors for targeted gene editing. His group has generated the first disease-resistant crop plant by using the TALEN technology. Previously, he was Research Assistant Professor of Plant Pathology at Kansas State University. Dr. Yang received his B.S. in 1986 and his M.S. in 1989 from Southwest Forestry College in China. In 2000, he received his Ph.D. from Kansas State University, where he continued his studies as a postdoctoral research fellow from 2001-2004.