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Phytopathology News

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Plant Health 2021 Online Preview: A Conversation with Keynote Speaker Dr. Honour C. McCann

Jim Bradeen, APS Internal Communications Officer

When University of Toronto Ph.D. student **Honour C. McCann** boarded a plane for New Zealand, she intended to start a 3-month research internship focused on the experimental evolution of host specificity in *Pseudomonas syringae.* Little did she know then how timely that move was!

Honour will present her keynote address, "Emergence and Evolution of Agricultural Plant Pathogens," at Plant Health 2021 Online (Tuesday, August 3). Her address will focus on how plant diseases emerge in agricultural systems, where plant pathogens come from, how they adapt to novel hosts, and genetic and ecological factors driving these interactions. Don't miss this one!

When I spoke with Honour recently, she declared, "Infectious diseases are never just a local issue." Truer, more timely words may have never been spoken! Although this quote certainly applies to the ongoing pandemic, Honour was instead referencing the importance of thinking globally in addressing plant health challenges. Her career trajectory provides an illustrative example. As Honour's plane touched down in Auckland, news was breaking of a new *P. syringae* outbreak in kiwifruit, a staple of New Zealand agriculture. In the following months, her planned research at Massey University pivoted to addressing how this outbreak originated, how the pathogen got to New Zealand, and what role wild plants played in the outbreak. Her 3-month internship morphed into a post-

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The Costs of Going Virtual for Plant Health 2021

With registration for Plant Health 2021 Online opening in May, you may have wondered where your registration fee goes. While going online makes scientific meetings far more accessible to a worldwide audience, counterintuitively, it does not make meetings less expensive to produce. In our dedication to delivering quality content at the best price possible, APS is providing a peek at our books to show the various costs associated with the production of a virtual meeting.

Software Licensing Fees

Event platforms require licensing fees based on attendee capacity and meeting length. Licensed Plant Health 2021 platforms include the professional version of Zoom used for meeting sessions; the technical abstract, programming, and event experience mobile and web app; the Kubify Research-on-Demand platform; and a new social interaction platform, Wonder, which will be used to enhance the interactivity and quality of this year's networking events.

Online Event Management Hours

The additional technological needs of a virtual meeting often require more staff time than an in-person meeting; this ensures attendees, presenters, and sponsors all get the most out of their virtual experience. Tasks applicable to virtual meetings include:

- Creation and testing of the online platform
- Construction of toolkits and resource materials for speakers, moderators, sponsors, and attendees
- Coordination of schedules with presenters and AV technicians
- Rehearsals and training for conducting sessions online

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In This Issue

Phytopathology News

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PLANT PATHOLOGY'S PERPLEXING PAST: THE REST OF THE STORY

Nebraska's Mysterious Gram-Positive Bacterial Diseases

Robert M. Harveson, University of Nebraska, Panhandle REC, Scottsbluff

Over the last few months, I have been relating the stories of an assortment of plant-pathogenic, Gram-positive bacteria and their importance in Nebraska agriculture over the years. This list includes the bacterial wilt pathogen of dry beans (*Curtobacterium flaccumfaciens* pv. *flaccumfaciens*) and three *Clavibacter* subspecies causing Goss' wilt of corn (*C. michiganensis* subsp. *nebraskensis*), bacterial wilt of alfalfa (*C. michiganensis* subsp. *insidiosus*), and bacterial mosaic of wheat (*C. michiganensis* subsp. *tessellarius*).

The term "Gram" refers to the reaction of bacteria cell walls to microscopic dyes that roughly separate bacteria into two primary groups—positive and negative. This system was originally developed by the Danish bacteriologist, **Hans C. Gram**. Curiously, Nebraska appears to be the original home for these pathogens, and they have historically influenced the production of several major crops. The dry bean pathogen *Curtobacterium flaccumfaciens* pv. *flaccumfaciens* and corn pathogen *C. michiganensis* subsp. *nebraskensis* are probably more familiar to contemporary readers due to recent epidemics worldwide, while the other two are relatively unknown today.

C. michiganensis subsp. *nebraskensis* and *Curtobacterium flaccumfaciens* pv. *flaccumfaciens* both rapidly emerged in Nebraska at approximately the same time in the mid-2000s, after similarly vanishing just as suddenly 20 years previously. The reemergence of both pathogens is thought to have been initiated, in part, by new cultural practices such as continuous cropping, reduced tillage, and dramatic acreage increases in sprinkler irrigation, all of which enhance disease development and progress. These farming practices were widely adopted in central and western Nebraska roughly a decade before the sudden and widespread reoccurrence of both pathogens.

However, we are baffled today as to the origin of *C. michiganensis* subsp. *nebraskensis* and *C. michiganensis* subsp. *tessellarius* and why the three very closely related *Clavibacter* subspecies (*C. michiganensis* subsp. *nebraskensis, C. michiganensis* subsp. *insidiosus,* and *C. michiganensis* subsp. *tessellarius*) and the distantly related *Curtobacterium flaccumfaciens* pv. *flaccumfaciens* have behaved so differently from each other after emerging and comparably disappearing. Cumulatively, these questions constitute the rest of the story.

Origin of Alfalfa Bacterial Wilt

We have more knowledge about the background of alfalfa wilt caused by *C. michiganensis* subsp. *insidiosus*. It was the first of the three *Clavibacter* subspecies to be discovered, studied, and recognized as a distinct disease in the mid-1920s, but it had likely been present in the United States, unnoticed, for many years prior to that. By 1926, it had been reported from every major alfalfa-producing state.

C. michiganensis subsp. *insidiosus* is now thought to have been introduced from Turkestan on seed or plant residues. Since alfalfa production began in the early 1890s, it is feasible that the pathogen could have been present in Nebraska long before the turn of the 20th century.

Turkestan is considered the birthplace of both pathogen and crop, and germplasm possessing disease resistance was rapidly found in this area. Plant explorers brought this material back to the United States, leading to the development of new wilt-resistant varieties, which assisted in the removal of the pathogen as a serious production problem. However, the genesis of the other two newer corn and wheat pathogens and why all three pathogens have reacted so differently from each other are unknown.

Three Clavibacter Subspecies

The alfalfa pathogen (*C. michiganensis* subsp. *insidiosus*) is still a persistent and common resident in Nebraska soils today. However, the breeding process has essentially eliminated this pathogen as a problem since the development of disease-resistant cultivars in the 1940s.

Likewise, corn breeders rapidly created productive, disease-resistant field corn cultivars in response to the corn pathogen's (*C. michiganensis* subsp. *nebraskensis*) first appearance in

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doctoral position and then a lectureship. She learned, with frustration, that although related pathogen lineages were known to challenge green kiwifruit production in Japan and South Korea, the newer gold variety introduced from New Zealand was highly susceptible to infection by all lineages. She was impressed and amazed by New Zealand farmers and scientists in addressing this challenge: "Everyone was very engaged, very sharp…they really picked up on the problem and were invested in trying to find solutions."

Honour now leads the Max Planck Independent Research Group for Plant Pathogen Evolution in Tübingen, Germany. Across her career, her research approaches and directions have been shaped by intense intellectual curiosity, hard work, and timely responses to emerging plant health challenges. Today, Honour continues to work in the kiwifruit/*P. syringae* pathosystem at Max Planck, as well as with *Ralstonia solanacearum.* She has positioned her research program to reveal how plant diseases emerge and spread; the importance of wild plant populations in the emergence of agricultural pathogens; and how plant diversity in managed and natural environments influence pathogen evolution.

I asked Honour what pressing issues and seismic shifts she sees coming to plant pathology. She spoke eloquently about the need for stronger, more integrated scientific collaboration across international borders; the impacts of climate change; and the value of broader sampling for plant pathogens in both agricultural and natural environments. "As plant pathologists we focus on the acute pathogenesis stage and important crops; we aren't sampling asymptomatic potential hosts. To proactively identify and address new and emerging plant health problems, we need to have broader sampling programs that extend outside focal crops that exhibit disease. We should be looking at what these bugs are doing, cultivated and wild, to identify potential disease reservoirs. If we can identify the reservoirs, we can study pathogen diversity and density to inform agricultural management practices, international trade, and plant breeding."

We are going to learn a lot from Honour! Don't miss her keynote address at Plant Health 2021 Online on Tuesday, August 3. Learn more about Dr. Honour C. McCann and other Keynote and Plenary presenters. ■

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the late 1960s. The pathogen dropped out of site in the early 1980s but has mystifyingly returned in a manner comparable to that of *Curtobacterium flaccumfaciens* pv. *flaccumfaciens* (bean pathogen), which also disappeared, but without the widespread use of disease-resistant cultivars.

In contrast, *C. michiganensis* subsp. *tessellarius* (wheat mosaic pathogen) seemingly vanished without a trace and has not come back. New resistant cultivars were rapidly developed in response to the new bacterial mosaic disease of wheat, but they were never deployed due to its short tenure. The reasons for the sudden arrival and abrupt disappearance of *C. michiganensis* subsp. *tessellarius* after only 3–4 years and its failure to resurface in the same manner as *C. michiganensis* subsp. *nebraskensis* and *Curtobacterium flaccumfaciens* pv. *flaccumfaciens* have never been explained.

Goss' wilt of corn. (Courtesy R. Harveson, University of Nebraska, Panhandle Research and Extension Center)

Additional Questions?

In 1980 University of Nebraska–Lincoln plant pathologist **Max Schuster** hypothesized about the provenance of *C. michiganensis* subsp. *nebraskensis*, asking "Is it possible that the corn roots have been in a 'bacterial soup' long enough to increase inoculum to the point for infection to take place and/or the opportunity to adapt soil bacteria or another vascular pathogen toward corn?" He further provocatively queried whether it was possible that the closely related *C. michiganensis* subsp. *insidiosus* (which was a commonly known pathogen of alfalfa in the same area of central Nebraska where Goss' wilt was apparently born) could have mutated or somehow been transformed by chemical agents to become parasitic on corn.

Could this same concept also explain the creation of the bacterial mosaic causal agent of wheat? Based on the high degree of genetic relatedness among the three *Clavibacter* subspecies and the fact that both wheat and corn have been grown in Nebraska for almost as long as alfalfa, it is plausible. Perhaps it is no coincidence that both the corn and wheat pathogens made their presence known within a roughly similar time period (1969 and 1976, respectively), which is a little more than 75 years after the beginnings of agriculture and the cultivation of these crops in Nebraska. Alternatively, because these pathogens can all reside asymptomatically on weeds, perhaps infections were simply a matter of time, susceptible varieties, and appropriate weather conditions?

Nevertheless, we are still left with a number of unanswered questions about the origin, survival, and spread of these bacterial pathogens. With a universal seed trade, new host varieties, predicted climate change, and new cultural practices, they could once again reemerge, potentially posing problems for successfully producing economically important crops in Nebraska. Now you know *the rest of the story*, as it is currently known.

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- Conversion of live content to on-demand recordings

Live Support During the Meeting

Novel technology requires novel support. To ensure attendee experiences are as smooth as possible, each of our 26 live Keynotes, Plenaries, POD Talks, and Special Sessions is preceded by a rehearsal session to familiarize presenters with the virtual tools, some of which they may never have worked with. All rehearsal and live sessions are attended by a member of APS staff and a hired AV technician. The staff member assists and guides the moderator experience and addresses issues or questions related to the meeting content. The AV technician assists with recording each session and addresses technical questions or challenges. Most people would be surprised to learn that every hour of live content requires four hours of live support.

Ensuring Accessibility for Attendees

Just as with in-person meetings, APS strives to ensure that our virtual Plant Health meetings are accessible to users with a variety of needs. One example of the work we undertake in this arena is ensuring our online meeting is ADA compliant. APS hires professional live captioners to attend our sessions and provide real-time closed captioning. We also pay captioning professionals to review and provide quality assurance for the closed captioning to ensure the accuracy of on-demand recordings.

Universal Meeting Costs

In addition to costs that are specific to virtual meetings, there are also costs that are incurred while developing a meeting, regardless of whether the format is virtual or in person. These standard meeting costs include:

- Mobile app development and licensing
- Marketing
- Graphics
- Registration processing
- Credit card fees
- Abstract software and processing
- Speaker fees

How Does a Virtual Meeting Save Costs?

A virtual meeting does save costs for APS related to the physical venue, and it saves travel and lodging costs for our attendees. Cost savings related to holding an event online instead of in person include those related to space rental, poster board set-up, event signage, AV set-up, food and beverage, and staff travel and lodging. Some of these costs are offset, however, by their "virtual venue" equivalent, such as Zoom and the online event platform.

Sustainability of the Free Registration Model

The previous virtual meeting, Plant Health 2020, had a complimentary Basic tier, which provided limited access to content, such as Plenary Sessions and Exhibits. Last year, APS created this tier while pivoting rapidly from an in-person to online event and ensuring that all of our members and supporters could attend during an incredibly challenging time personally and professionally. This year, APS has had a great deal more time to plan our virtual event. We also received feedback in our postmeeting survey that the Basic tier did not provide members with the level of content that they desired as an attendee. Plant Health 2021 promises to provide a more interactive experience, with platforms that optimize the online event experience. Given all of the previously mentioned costs associated with an online event experience, a free, limited registration option was not viable this year.

As a scientific organization, the value of APS is defined by the hard work of its members—much of which is presented at meetings like Plant Health 2021. Registration fees ensure that this work is showcased in a professional manner and engenders greater enrollment by attendees by communicating the value of the content.

APS continues to be diligent in providing our attendees with the best value at the lowest price possible. We hope you'll be able to log in with us at Plant Health 2021, and we hope to meet many of you in person in 2022! ■

Public Policy Board

Pesticide Regulation in the United States

G. Tomimatsu, V. Stockwell, A. Charkowski, C. Bradley, and T. Harp

Emerging (and re-emerging) populations of insect pests and plant pathogens drive the need for effective pesticides to protect and sustain U.S. agriculture. Knowledge and comprehension of the complexities of pesticide regulation are essential for plant pathologists to implement effective pest management products and practices for safe use and economic crop production. Pesticide manufacturers and developers are required to provide the necessary data for federal registration and associative labeling (=labels). The label translates the results of U.S. Environmental Protection Agency (EPA) evaluations into sets of conditions, directions, and precautions for pesticide users. The label language is consistent and clear on pesticidal products so that the pesticide will be used as specified on the label. Pesticide product labels as approved and accepted by the EPA are the law, and they also serve to manage potential risks from pesticides.

Because of the importance of pesticides in disease management, this article is intended to provide an overview of current aspects of the EPA's role in pesticide regulation in the United States and in extending the plant-protective toolbox. This article also emphasizes the EPA's rigorous evaluation process for pesticides before their registration in the United States, and periodically afterward. EPA evaluation processes include the assessment of data from guideline testing (OPPTS Guidelines for Testing specify EPA-recommended methods to generate data that are submitted to the EPA to support the registration of a pesticide) and other supportive documentation for the safe uses and best practices to protect crops.

Background and History

Since 1972 various amendments and reauthorizations of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) have strengthened the enforcement provisions of FIFRA and broadened the legal emphasis on protecting human health and the environment. Public concerns about the toxic effects of pesticides on applicators,

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plant health 2021 online

Seismic Shifts in Disease Risk

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nontarget species, the environment, and residues on foods have prompted significant changes in the original FIFRA legislation.

The initial intent of FIFRA was to protect farmers by requiring accurate labeling of pesticide contents and to enable farmers to make informed choices regarding the use of a product in pest management and control. In 1970, responsibility for administering FIFRA transferred from the U.S. Department of Agriculture (USDA) to the newly formed EPA to assess and manage the risks of toxic substances (including heavy metal uses, paints, disinfectants, pesticides, etc.) to human health and the environment.

Presently, federal review of plant protection products (excluding clinical and veterinary drugs) used to manage plant and animal pest populations in the United States involves five major regulations: the Food Quality and Protection Act (FQPA), including key parts of FIFRA and the Federal Food, Drug and Cosmetic Act (FFDCA); the Pesticide Registration Improvement Act (PRIA); and the Endangered Species Act (ESA). The EPA must review substantive data and information from the manufacturer that would support a finding that using the pesticide according to labeled specifications "will not generally cause unreasonable adverse effects on the environment," meaning "(1) any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide, or (2) a human dietary risk from residues that result from a use of a pesticide in or on any food inconsistent with the standard under section 408 of the Federal Food, Drug, and Cosmetic Act."

In 1996, the U.S. Congress unanimously passed FQPA, which requires the EPA to review registered pesticides every 15 years. Furthermore, the EPA must consider certain factors before establishing tolerances (maximum amounts of pesticide residues on raw agricultural commodities). The EPA must make a safety finding of "a reasonable certainty of no harm" before a pesticide can be registered for application to food or feed crops after assessing data regarding 1) aggregate (e.g., dietary and drinking water) and nonoccupational (e.g., residential use) exposures; 2) cumulative exposures to pesticides that have a common mechanism of toxicity or mode of action; 3) potential for increased susceptibility to hazardous exposures by sensitive subpopulations (e.g., infants, pregnant mothers); and 4) effects of endocrine disruptors. To simplify, chemical risk assessments conducted by the EPA are characterized as a function of toxicity and exposure. Although evaluation of the cumulative effects of pesticides presents a formidable challenge, EPA risk assessors anticipate that these evolving risk assessments will enable managers to make regulatory decisions that more fully protect public health and sensitive subpopulations.

For example, the EPA has performed cumulative risk assessments for groups of pesticides that share a common mechanism of toxicity. Risk assessors approximate people's actual exposures and potential risks resulting from current uses of these pesticides in different regions of the country by considering potential exposures from food, drinking water, and residential sources. To account for the considerable variation in potential exposures across the country, regional exposures from residential and drinking water sources are approximated in the cumulative risk assessment.

The Pesticide Registration Improvement Act (PRIA) of 2003 (reauthorized in 2007 and 2012) increased the accountability of government and industry. Manufacturers are required to pay service fees to the U.S. Treasury for a registration decision, depending on the category of the pesticide (conventional, antimicrobial, biopesticide, and inert ingredients) and the category of the registration action (new active ingredient, new use, and tolerance application, as well as three additional registration action categories). Further, the EPA must meet prespecified decision review times to create a more predictable evaluation process for manufacturers and ensure adequate safety of pesticidal use(s) in the United States.

Overview of the Pesticide Registration (Licensing) Process

The EPA interprets the FIFRA definition of pesticides to mean "…any substance or mixture of substances *intended* for preventing, destroying, repelling or mitigating any pest,…or if the substance(s) have "*intended* uses as a plant regulator, defoliant, desiccant or as a nitrogen stabilizer" (2012 edition of 7 USC, Sec. 136). In order to register a pesticide for use and distribution in the United States, manufacturers must include comprehensive information about their product(s) ingredients; specify particular site(s) or crops where the pesticide is intended for use; specify the amount, frequency, and timing of its uses; and provide specifications for appropriate storage and disposal in their application. The EPA's subsequent evaluation of these data includes a scientific assessment (with appropriate peer review, as necessary) of the pesticide's potential for 1) harm to humans, wildlife, fish, plants, and other nontarget organisms, including endangered species; and 2) contamination of surface water or groundwater from leaching, runoff, and spray drift. The resultant scientific assessments are critical for informed decision making and for generating precautionary statements to ensure minimal risks to humans and the environment. Precautionary label statements are identified by subheadings such as "Humans and Domestic Animal Hazards," "Environmental Hazards," and "Physical or Chemical Hazards." The Worker Protection Standard is required on all pesticidal products intended for use in or on agricultural establishments and include requirements for personal protection equipment, the minimum elapsed time requirement before reentry is permitted into a treated area, and treatment for accidental exposure.

Some federal labels may include guidance or recommendations to reduce the potential for development of resistance to the active ingredient (e.g., bactericide, fungicide, herbicide, or insecticide resistance development), but adherence may not be mandatory. In other cases, resistance mitigation methods may be required for conditional registration or a time-limited registration (types of registrations are described below). In a recent conditional registration example from January 2021, the EPA announced amended labeling requirements for 7 years of use of streptomycin to manage citrus greening and citrus canker in Florida. (The EPA collaborated with the Food and Drug Administration, the Centers for Disease Control and Prevention, and the USDA to evaluate potential bactericide and fungicide resistance. The label contains requirements to delay antibiotic, fungicide, and bactericide resistance. Registration terms require resistance-management plans, monitoring, and annual sales reports. Mitigation is being implemented to address potential antibiotic resistance, applicator exposure, and spray drift.)

In addition to draft labeling and the required test data for EPA assessment and licensing, pesticide registrants must also include appropriate fees and completed forms to initiate statutory and procedural priorities. The EPA publishes a notice of receipt in the *Federal Register* (a daily publication of the U.S. federal government that issues proposed and final administrative regulations of federal agencies) for registration applications of products that contain a new pesticidal active ingredient or those that propose new uses (e.g., new crop or targeted pest). For risk management and regulatory decision making, the EPA reviews measures needed to mitigate identified risks and researches other registered pesticides that could be used. The EPA discusses with the

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registrant whether modifications to the product or federal labeling must be made to mitigate the risks and/or establish new food tolerances after publishing notices for a comment period in the *Federal Register*. The EPA grants the registration if no changes are needed or if necessary modifications are accepted by the applicant. The EPA then publishes a notice of issuance of the registration in the *Federal Register*.

There are several types of registrations under FIFRA. 1) Section 3 allows the EPA to register pesticides for use throughout the United States, although some states may permit or restrict some uses. States, tribes, and territories can place further restrictions on pesticides used or sold within their own jurisdictions. 2) Under certain well-defined circumstances, the EPA can conditionally register pesticides under Section 3(c)7. For example, if the pesticide meets the standard for registration and there are outstanding data requirements, then the EPA may grant a conditional registration, after the EPA determines that use of the pesticide would not significantly increase the risk of unreasonable adverse effects on humans or the environment. 3) The EPA allows manufacturers to field test pesticides using commercial application equipment to understand the chemical or biological properties of the pesticide, its safety, and relative efficacy. Under Section 5 (40 CFR, Part 172) of FIFRA, the EPA can issue an experimental use permit to establish limited conditions for the transportation, application, and disposal of the test pesticide. 4) The EPA is authorized to allow state and federal agencies to permit unregistered uses of a pesticide under Section 18 (Emergency Exemptions), if there is substantive evidence that "non-routine" and "urgent" needs exist for a time-limited use for a specified area or crop. There are four different types of emergency exemptions: specific, quarantine, public health, and crisis. 5) States can register a new pesticide product for any use or a federally registered product for an additional use, if there is both a "demonstrated special local need" (Section 24c) and a tolerance or exemption from a tolerance. The EPA also has the authority to disapprove of a state's special local need registration application. Most importantly, specific labels must be issued and accepted by the EPA for each of these types of registrations. All registered pesticides will have an EPA registration number on the label.

Education, Compliance, and Enforcement

The portfolio of regulated pesticides and their associative uses is extensive and includes products used in commercial production of agricultural crops, products for landscaping, disinfectants and other antimicrobials, pesticides for structural and indoor pests, and products purchased and used by homeowners. The EPA focuses efforts on those segments that pose the greatest potential risks to carry out its mission to protect human health and the environment.

FIFRA is an act of intent, and civil or criminal penalties may ensue if a pesticide is used in a manner inconsistent with the label. Generally, a state has primary authority within the state for compliance monitoring and enforcement against the improper use of pesticides (e.g., uses in violation of the requirements on the label). There are many tools available to make a compliance determination, including off-site record reviews and on-site inspections and records of providing assistance to enhance compliance with the regulations promulgated under FIFRA.

As of this writing, most states, territories, and tribal nations have pesticide safety education programs and generally are authorized to certify pesticide applicators. Not all states require certification of all pesticide applicators, unless the pesticide is labeled for restricted use.

The "restricted use" classification restricts a product, or its uses, to use by a certified applicator or someone under the certified applicator's direct supervision. Restricted-use products have the potential to cause unreasonable adverse effects to the environment and injury to applicators or bystanders without added label restrictions. Additional information on the restricted-use classification and pesticide registration is found in 40 CFR 152. (Part 40 CFR, Section 152: Code of Federal Regulations for Protection of the Environment codifies pesticide regulations, and the scope of this section sets forth procedures, requirements, and criteria for the registration of pesticide products under FIFRA Section 3.)

Concluding Remarks

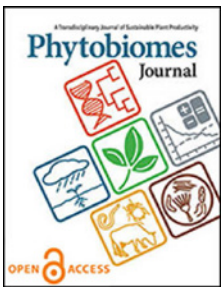
Pesticide product labels (=the law) play an essential role in regulation and risk management for the user community. Anyone who applies pesticides must comply with federal and state laws. More detailed information on the EPA's pesticide program, pesticide regulation, and risk assessment is available on the EPA website. The user-friendly website also includes links to other topics of interest: for example, news highlights, partners, a special kids section, and links to databases such as the Pesticide Product Labeling System, which is a collection of product labels accepted by the EPA under FIFRA Section 3. We recommend that readers review some pesticide labels, online or the folded labels in the garden products section of a nursery or hardware store, to increase their understanding of the breadth and complexity of pesticide regulations. The reader is reminded that pesticides approved for sale and distribution in the United States will have an EPA registration number. If a product is labeled as a pesticide or has pesticidal intent and if the product does not have an EPA registration number, the product may be mislabeled or misbranded. For assistance with compliance and enforcement programs and policies, the reader is directed to the EPA's website on compliance.

Pesticides will continue to be very important tools for growers globally to ensure a high-quality, safe, and sustainable food supply for increasing populations. The science-based rigorous regulations enforced by regulatory agencies are in place to allow these important tools to be used in agriculture with the lowest possible risk to human health and the environment. Because risk assessments need to consider many moving targets, plant pathologists have a variety of experiences and perspectives that could support and/or refine the data necessary to substantiate pesticide exposures and label claims that are critical to scientifically based risk assessments. Their cumulative knowledge of the biology of plant pathogens, disease epidemiology, and responsible pest management combined with registered chemical and biopesticide (including biotechnological) applications are essential to add to the economic health and sustainability of agriculture and forestry in dynamic global climates. ■

Phytobiomes Journal Publishes Phytobiomes of Bioenergy Crops and Agroecosystems Focus Issue

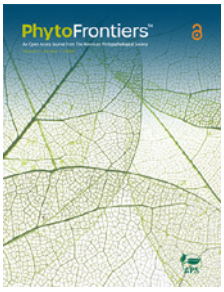
Guest Editors: Kate Zhalnina, Ashley Shade, Jennifer Pett-Ridge, Christine Hawkes, and Mary Firestone

Focus Issue Editor-in-Chief: Carolyn Young



The inaugural *Phytobiomes Journal* focus issue highlights research aimed at understanding and harnessing the phytobiomes associated with bioenergy crops. Microbiome manipulation could help increase overall bioenergy production, especially on marginal lands. Read the editorial to learn more about the microbiomes associated with bioenergy crops, the effects beneficial microbes have on their hosts, and the potential ecosystem impacts of these interactions and review the rest of the focus issue to learn more about increasing productivity and sustainability in bioenergy crops. See all focus issue articles. ■

PhytoFrontiers™ Publishes Second Issue



The latest issue of the fully open access journal *PhytoFrontiers*™ includes an article about using aerated steam to manage angular leaf spot in strawberry nursery production.

William Turechek and colleagues set out to develop a new heat-based treatment that would kill pathogens without hurting the plant. When asked what most excited them about their research and new method Turechek responded, "That it works! By introducing a lower-temperature conditioning step and using steam rather than hot water, we produced plants that were better able to withstand the higher temperature treatment designed to destroy the pathogen."

Read this article and others in the second issue of *PhytoFrontiers*.

Interested in Submitting to *Phytobiomes Journal* or *PhytoFrontiers*?

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2021 APS Award Winners Announced

Congratulations to our fellow members and colleagues selected to receive APS awards in honor of their significant contributions to the science of plant pathology! Awardees will be recognized during the virtual award ceremony held during Plant Health 2021 Online on Tuesday, July 27, 2021, and at the Social and Networking Event with Awardees on Tuesday, August 3, 2021. Read more about the 2021 awardees.

Lee M. Hutchins
Rodrigo Almeida, University of California, Berkeley

Ruth Allen
Wenbo Ma, The Sainsbury Laboratory, United Kingdom

Syngenta
Nik Cunniffe, University of Cambridge, United Kingdom

William Boright Hewitt and Maybelle Ellen Ball Hewitt
Jonathan Jacobs, The Ohio State University

Excellence in Extension
Alfredo Martinez-Espinoza, University of Georgia

Excellence in Industry
Chenglin Yao, Corteva Agriscience

Excellence in International Service
Robert Kemerait, University of Georgia

Excellence in Regulatory Affairs and Crop Security
Lucita Kumagai, California Department of Food and Agriculture

Excellence in Teaching
María del Mar Jiménez-Gasco, Pennsylvania State University

Fellows
Ranajit Bandyopadhyay, International Institute of Tropical Agriculture, Nigeria
Marc Fuchs, Cornell University
John Hammond, USDA-ARS Florist and Nursery Crops Laboratory
Saskia Hogenhout, John Innes Centre, United Kingdom
Jennifer Juzwik, USDA Forest Service
Cindy Morris, INRA, France
Melodie Putnam, Oregon State University
Serge Savary, INRA, France
Arne Stensvand, Norwegian Institute of Bioeconomy Research, Norway
Frances Trail, Michigan State University
Rodrigo Valverde, Louisiana State University ■

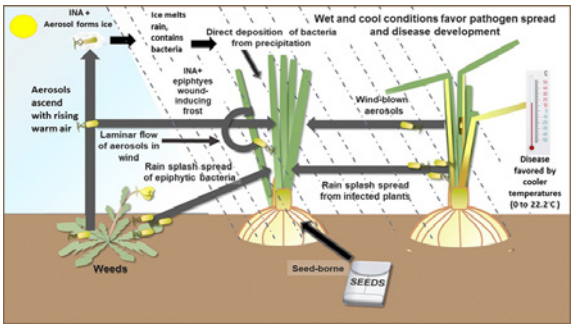
APS Education Center Publishes New Plant Disease Lesson

Freely available to all, the APS Education Center provides peer-reviewed publications comprising the content of the online teaching journal *The Plant Health Instructor* and other educational resources for K-12 students, as well as advanced plant pathology students. Resources include Plant Disease Lessons, Lab Exercises, and Case Studies, among others.

Plant Disease Lessons (or profiles) are designed for higher education students with a basic background in biology but no specific knowledge of plant pathology. They include sections on symptoms and signs; pathogen biology; disease cycle and epidemiology; disease management; and significance. **Mei Zhao** and colleagues recently published a Plant Disease Lesson on "Bacterial Streak and Bulb Rot of Onion," a very destructive disease that causes foliage damage and bulb decay and may result in significant economic losses.

Read the new lesson or see the full list.

To submit to *The Plant Health Instructor,* educators should read the author guidelines for more details. Prospective authors should contact Editor-in-Chief **Brantlee Spakes-Richter**. Submissions are peer-reviewed, and accepted manuscripts are freely available when published. ■



A proposed disease cycle of bacterial streak and bulb rot in onion caused by Pseudomonas viridiflava.

APS Foundation

Congratulations to the 2021 APS Foundation Awardees

The APS Foundation is excited to announce the following APS members received awards from the APS Foundation in 2021. A special thanks to our donors who support the APS Foundation! Your continued support makes these opportunities possible. Read more for a complete list of awards and awardees.

Books for the World Award

- **Andrea Alejandra Arrua**, Universidad Nacional de Asunción, Paraguay
- **Wadzani Dauda Palnam**, Federal University Gashua, Nigeria
- **Faheem Uddin Rajer**, Sindh Agriculture University, Pakistan

French-Monar Latin American Award

- **Edilaine Mauricia Gelinski Grabicoski**, Universidade Estadual de Maringá, Brazil

I.E. Melhus Graduate Student Symposium

- **Hanareia Ehau-Taumaunu**, Pennsylvania State University
- **Carrie Fearer**, The Ohio State University
- **Prabha Liyanapathiranage**, Auburn University
- **Rishi Ram Bhandari**, Auburn University

Lafayette Frederick Diversity in Mentoring Award

- **Corri Hamilton**, University of Wisconsin–Madison
- **Tiffany Lowe-Power**, University of California, Davis

Raymond J. Tarleton Student Fellowship

- **Li Wang**, University of Georgia

Schroth Faces of the Future Awards

- **Kaitlyn Bissonnette**, University of Missouri
- **Sebastian Eves-van den Akker**, University of Cambridge, United Kingdom
- **Deepak Haarith**, University of Wisconsin–Madison
- **Kanan Saikai**, International Institute of Tropical Agriculture, Kenya
- **Lei Zhang**, Purdue University

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Support

The American Phytopathological Society Foundation

Lafayette Frederick Diversity in Mentoring Award

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The Lafayette Frederick Diversity in Mentoring Award provides mentored experiences in plant pathology for students and postdocs from underrepresented minority groups, with the goal of increasing diversity in APS and the plant health community at large.

A fundraising goal of $100,000 has been set to endow this award and provide two $1,000 awards yearly. The APS Foundation and APS Council have pledged $20,000 each in matching funds.

Every penny will help – support the Lafayette Frederick Diversity in Mentoring Fund today

Give to the
APS Foundation
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Lindsey du Toit

Professor, Washington State University Department of Plant Pathology

I had not heard of plant pathology when I started university, and I had no background in agriculture. I ventured into the field of plant pathology after receiving impactful, life-changing mentoring from gracious people who helped me understand the tremendous opportunities and fulfilment of this profession. Donating to the Lafayette Frederick Diversity in Mentoring Award is a wonderful opportunity to honor those who mentored me, and support others who mentor students and postdoctorates from underrepresented minority groups. All aspects of our profession and society truly are strengthened by diversity in our membership! I look forward to seeing the fruits of this award benefit our society and honor the legacy of Dr. Lafayette Frederick.

Dr. Chinyere Knight

Assistant Professor Department of Biology Tuskegee University, Tuskegee, AL

I cherish my years of training with Dr. Frederick. His life story and pedagogical beliefs are profound excellence and there is no one to compare. He provided a model of distinction, discipline and humility that is required to be successful in science.

APS FOUNDATION

Thank you for your support!

APS Foundation Board

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The American Phytopathological Society, 3352 Sherman Ct, Suite 202, St. Paul, MN 55121

Update from the Joint Potomac and Northeastern Divisions Meeting

Chris Clarke, USDA-ARS, and Kari Peter, PSU

The 2021 American Phytopathological Society Potomac and Northeastern Division Meetings were held jointly March 10–12, 2021. Despite the current challenges, the joint virtual meeting was an overall success. The opportunity for the members of these two neighboring divisions to meet and interact with one another was a major positive that resulted from the need to transition their meetings to a virtual platform. In total, the meeting included 12 symposium,12 contributed paper, 16 graduate student, 16 poster, and 21 industry and extension presentations. Additionally, APS President **Mark Gleason** provided an update on current initiatives from APS headquarters, and the APS Career Council provided a well-attended and well-reviewed CVs 101 Workshop.

The presentations covered a range of exciting and important topics in plant health. The three symposia topics for the meeting were New and Reemerging Diseases; Phytopathology in Action: Extension and Industry Research; and 21st Century Tools: Genomic Approaches to Plant Disease Epidemiology, Diagnostics, and Management. Overall, the scientific content of the meeting was excellent. One advantage of the virtual meeting was the opportunity to invite speakers from outside the divisions to give presentations in the symposia. We would like to specifically thank the speakers from outside the divisions who gave presentations: **David Cooke** (James Hutton Institute), **Joe LaForest** (University of Georgia), **Kaitlyn Bissonnette** (University of Missouri), and **Jeff Chang** (Oregon State University). One major disadvantage of the virtual meeting platform was the inability to interact with poster presenters in person. The online platform gather.town was used to partially overcome this limitation. In this platform, meeting attendees enter a virtual space that looks like an 8-bit video game and can move their avatars to view posters and have live video chats with poster presenters and other meeting attendees. While not perfect, tools like this can enable some of the one-on-one interactions that are lacking in virtual meetings.

For most meeting attendees, the highlight of the meeting was the graduate student presentations. The general consensus was that all of the students gave wonderful presentations and are performing exciting and important thesis work. The future of APS is bright! The winner of the Potomac Division graduate student presentation was **Abdullah Nahiyan** (Virginia Tech), who presented "*Rhizobium vitis* ARK-1 Reduces Grapevine Crown Gall Formation Against Higher Cell Density of Tumorigenic Isolates and Over a Wide Application Timings." The winner of the Northeastern Division graduate student presentation was **Glen Groben** (Rutgers University), who presented "Distribution of Dollar Spot Fungus in Asymptomatic and Symptomatic Turfgrass." Both students will represent their respective divisions by giving their winning presentation, along with winners from the other APS Divisions, in the Plant Pathologists of the Future Showcase during Plant Health 2021 Online.

Other highlights included the presentation of two additional awards for the Northeastern Division (NED) and one additional award for the Potomac Division. The 2021 APS-NED Award of Merit was presented to **Cheryl Smith**, plant health state specialist at the University of New Hampshire Extension. Dr. Smith has been one of the most regular attendees of APS-NED meetings throughout her career, serving as president in 2006–2007. She has never failed to intrigue attendees at the extension meeting each year with excellent photos and information about interesting diseases that came through her clinic throughout the year. We have had wonderful, fun times with her and many fond memories. She will be sorely missed after she retires this June. The 2021 APS-NED Early Career Award was presented to **Srdjan Aćimović**, senior extension associate in the School of Integrative Plant Science Plant Pathology and Plant-Microbe Biology Section of Hudson Valley Research Laboratory Cornell AgriTech. Dr. Aćimović has been an active participant in APS-NED since he started at Cornell University in 2016. Stationed at the Hudson Valley Laboratory, he conducts most of the research and extension programming for disease management of tree fruits, particularly apples and pears, using forecasting models for precise disease prediction, and effectively communicates important information to growers using various digital tools. While this year he joined us on the Northeastern Division side, next year he will be sorely missed as he moves to Virginia Tech and is welcomed by our friends in the Potomac Division! For the Potomac Division, the Distinguished Service Award was presented to **Mahfuz Rahman**, extension plant pathologist and director of plant diagnostics at West Virginia University. Dr. Rahman has been a mainstay of the Potomac Division for years, always providing valuable extension and research updates. Additionally, Dr. Rahman has served the division as secretary-treasurer, vice president, and president.

Despite everyone's best efforts to utilize available technology, the lack of both formal and informal in-person interactions resulted in the meeting feeling incomplete. Virtual meetings ultimately are not a perfect replacement for in-person meetings, especially for newer members who have not had a chance to meet other division members. Nevertheless, the ability to host virtual meetings has improved tremendously in the past few years. Therefore, both divisions noted a commitment to provide options for virtual participation in future years to improve our inclusivity for members who may have challenges with traveling to in-person meetings. Best practices for hybrid in-person/virtual meetings will take some time to figure out, but after the past year, it should be a real possibility to successfully host such hybrid meetings.

The 2022 APS Potomac Division Meeting will be held in Winchester, VA, in March 2022. Since Plant Health 2022 will be held in Pittsburgh, PA, an abbreviated 2022 APS Northeastern Division Meeting will be in held virtually in the spring, with an emphasis on the Graduate Student Oral Competition. Stay tuned for additional details. We look forward to seeing all of the colleagues we have missed for the past two years and to welcoming many new members to the divisions! ■

Highlights from the 98th Southern Division Meeting

Southern Division Executive Committee

The Southern Division of the American Phytopathological Society held its 98th Annual Meeting virtually, February 15–19, 2021. Approximately 165 people registered for the meeting, which included student research competition sessions, poster sessions, technical sessions, workshops, a graduate student meeting and social, the business meeting and awards banquet, and networking sessions.

The Genomic Approaches to Plant Pathology: Bioinformatics as a Powerful Tool Workshop, organized by **Teddy Garcia-Aroca**, APS-SD graduate student representative, consisted of presentations on analysis of population data in R, association mapping in microbial organisms, and microbiome data using the DADA2 pipeline given by **Niklaus Grünwald**, USDA-ARS and Oregon State University, and **Nicholas Carleson**, Oregon State University; **Jonathan Richards**, Louisiana State University; and **Sharifa Crandall**, Pennsylvania State University, respectively. Attendees enjoyed the workshop and left more knowledgeable about various tools available for genomic analyses.

The first iteration in the Careers 101 Workshop Series, CVs 101, was repeated for the first time, but with a new approach. The workshop was led by **Nicole Gauthier**, APS-SD divisional forum representative, with the assistance of experts from academia, government, and industry. Over 30 graduate students and postdocs learned how to develop a tailored CV for academic, government, or industry job postings. Workshop attendees worked with experts in the various sectors to practice CV development using sample job descriptions.

In addition to the annual Graduate Student and Postdoctoral Meeting and Social, students and postdocs were invited to participate in two networking events. Pitch Perfect allowed participants to meet new people and introduce themselves while practicing their 2-minute elevator pitches. Talk to an Expert allowed participants to join virtual breakout rooms with designated topics and experts to meet the experts and ask questions. Topics and experts for Talk to an Expert included APS Leadership/Volunteering with **Ashok Chanda** (North Central Division), **Lawrence Datnoff**, **Guy Boyd Padgett**, and **Katy Stevenson**; Early Career with **Braham Dhillon**, Jonathan Richards, **Jeff Standish**, and **Tessie Wilkerson**; Extension with **Travis Faske**, Nicole Gauthier, **Rebecca A. Melanson**, and **Ed Sikora**; Industry with **Tyler Harp**, **Sierra Hartney** (Pacific Division), **Mason Newark**, and **Kenny Seebold**; and USDA with **Jason Hong**, **Shaker Kousik**, **Rebecca Sweany**, and **Bill Wintermantel** (Pacific Division). Both networking sessions were organized by Teddy Aroca-Garcia and **Hope Becton**, APS-SD graduate student representatives, and Rebecca A. Melanson, APS-SD secretary-treasurer.

One of the highlights of the Southern Division Meeting has always been the Graduate Student Research Competition. Fourteen students from five universities, representing many states within the Southern Division, presented their research in the competition. **Andres Sanabria**, North Carolina State University, placed first in the competition for the presentation "Exploring Alternative Management of Plant Pathogens of Stevia in North Carolina, Mexico, and Paraguay." **Owen Hudson**, University of Georgia, placed second for the presentation "Characterization of Prothioconazole Resistance in *Fusarium oxysporum* f. sp. *niveum* (FON) Laboratory Mutants." **Kendall Johnson**, University of Georgia, placed third for the presentation "Spatial Analysis of Phony Peach Disease in Commercial and Research Peach Orchards in Georgia." Honorable mentions were awarded to **Kimberly D'Arcagelo**, North Carolina State University, and **Madison Stahr**, North Carolina State University, for the presentations "Utilizing a Population Genetics Approach to Facilitate Crop-Specific Management of the Cucurbit Downy Mildew Pathogen, *Pseudoperonospora cubensis*" and "Identifying and Evaluating Vector Competency of Insect Pests in North Carolina Sweetpotato Storage Facilities for Dispersal of *Ceratocystis fimbriata*," respectively.

Seven students participated in the Student Poster Competition. **Brittnay Meyer**, Texas A&M University, placed first in the competition for the poster "Taken in Plain Sight: Fungal Pathogens Affecting Watermelon Production Fields in Texas." **Sandhya Neupane**, Tennessee State University, placed second for the poster "Evaluation of Chemical and Biocontrol Products for the Management of Fusarium Root and Crown Rot of Oakleaf Hydrangea."

An additional 30 technical presentations were given at the meeting, including 20 oral presentations and 10 poster presentations. All technical sessions were moderated by graduate students or postdoctoral researchers who did an excellent job in keeping presenters on time.

APS-SD Scholarships, which replaced the usual travel awards for 2021, were presented to **Juanita Gil**, University of Arkansas; **Krishna Neupane**, Tennessee State University; and Sandhya Neupane, Tennessee State University.

Judging Travel Award applications, research presentations, and posters is no easy task, especially when so many are deserving of an award. Many thanks go out to our judges: **Dan Anco**, **Liliana Cano**, **Joseph Carillo**, **Savithri Purayanur**, **Yara Rosado Rivera**, **Terry Spurlock**, Jeff Standish, **Lindsey Thiessen**, and **Sara Thomas-Sharma**.

Award recipients were recognized at the Awards Ceremony held following the annual business meeting. The division's highest honor, Outstanding Plant Pathologist, was given to **David Appel**, Texas A&M University, for his outstanding research and extension contributions to oak, grape, and citrus disease management. The Southern Division's Donald M. Ferrin Memorial Service Award was given to Shaker Kousik, USDA-ARS, for his exemplary service to the Southern Division and APS.

Many thanks to **William Richardson**, vice president for agriculture and Chalkley Family Endowed Chair and dean of the College of Agriculture at Louisiana State University and LSU AgCenter, for welcoming everyone to the meeting, and to **Ronald Walcott**, APS vice president, for presenting an update from APS Council.

Many thanks also to our 2021 APS-SD meeting sponsors, whose support was critical for the variety and success of our meetings: AgBiome, AMVAC Chemical Corporation, BASF, Certis USA, Corteva Agriscience, Erwin Keith, Inc./Progeny Ag, FMC Corporation, Gowan Company, HM Clause, Nichino America, Progeny Ag, Syngenta, and Valent USA. An industry sponsors symposium was held for the second year in a row as a part of the Southern Division Annual Meeting, and representatives from many of our sponsors participated and presented information about their companies and products.

Southern Division, continued on page 14

Donors of Distinction

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Meet some of the amazing people who support APS Foundation. Learn more about who they are and why they give their time and resources to support others.

Larry Madden

I joined APS as a new M.S. degree student in January 1976. I actually would have joined in the fall of 1975, but membership in those days was on a strict calendar-year basis. I attended my first annual meeting the same year, traveling in a 15-passenger van for 16+ hours from Penn State to Kansas City. It was worth the trip! I fell in love with APS early and have been very active in the organization ever since. I have only missed one annual meeting (1978) since joining. My growth as a professional, and as a person, is completely tied up with APS. I started as a shy kid from an anthracite coal-mining town who was afraid of talking in front of a crowd, and 21 years later was president of APS when our annual meeting was in Rochester, NY. A few years earlier I had served as editor-in-chief of *Phytopathology*.

It is hard to believe that it has been nearly a quarter century since I served as APS president, mostly because I have been so active in the organization. I have especially loved giving the many half-day and full-day statistics workshops at the annual meetings during the past 15 years. There has been an explosion of interest in premeeting (and between-meeting) workshops recently, and we now have a great group of individuals who are proposing and teaching them. APS is a true force for good in the United States and the world. Although there are many specialized scientific organizations (I belong to several), APS is the one organization that looks out for all plant pathologists and advocates to the public and the policy makers on the importance of plant diseases.

I especially admire the many contributions made by the APS Foundation over many years. I am proud that the Student Travel Fund started during my time in the presidential lineage for the society. This program really generated tremendous buzz and strongly motivated a great deal of financial giving by APS members. I trust that the giving will continue for a long time; I will be doing my part.

There are so many dedicated individuals within APS who are at the forefront of basic and applied research and who are making a real difference in the management of plant diseases. I cherish the friendships I have made with many of them and look forward to making many new friends.

***Larry Madden** is a professor of plant pathology at Ohio State University's OARDC campus, APS Fellow, recipient of the APS Award of Distinction, and former president of APS.*

John Sherwood

At my first APS meeting, where I likely under appreciated the technical sessions and over appreciated the night life of East Lansing, I met **Steve Nelson** lugging APS PRESS materials across the Michigan State University campus. Steve later became executive vice president of APS and a lifelong friend. I also began my engagement in the many facets of APS. Subsequent APS meetings provided both a venue to present research and to network, leading to participation in invigorating multidisciplinary investigations. In subsequent years of volunteering in APS, my professional skills were enhanced by serving on editorial boards, committees and other APS boards, and serving in APS officer positions. The skills developed in these volunteer experiences led to opportunities outside my "day job" at the University of Georgia, such as time spent at the Office of Science and Technology Policy in the Executive Office of the President of the United States. A great strength of the APS membership has been the initiatives undertaken to enhance awareness of the value of diversity to an organization. The APS Foundation has been very important in facilitating success in expanding diversity in APS. Hence, member support for the APS Foundation is important for both our science and to be inviting and inclusive of all those interested in plant health.

***John Sherwood** is a retired head of the Department of Plant Pathology and assistant dean for the Office of Diversity Relations at the University of Georgia and a former president of APS.* ■

Graduate Students: Apply to be Featured in *Phytopathology News*!

For each issue of *Phytopathology News*, the APS Graduate Student Committee chooses a graduate student to be featured in a spotlight article. Applicants are chosen based on their involvement in APS as student members and their expected graduation dates. The committee strives to integrate students into society affairs and activities and recommends ways to address student concerns. Submit your application for consideration on the submission webpage. ■

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At the end of the Awards Ceremony, the APS-SD Executive Committee officers transitioned to their new duties as part of the 2021–2022 Executive Committee: **Trey Price**, LSU AgCenter, immediate past president; **Fulya Baysal-Gurel**, Tennessee State University, president; Lindsey Thiessen, USDA-APHIS, president-elect; and Dan Anco, Clemson University, vice president. Rebecca A. Melanson, Mississippi State University, was appointed to a third term as secretary-treasurer. Nicole Gauthier, University of Kentucky, divisional forum representative for the Southern Division, and Hope Becton, Clemson University, graduate student representative, will continue in their roles for the upcoming year. **Shelly Pate**, University of Tennessee, also joins the APS-SD Executive Committee as the second graduate student representative. Recognition also goes to Shaker Kousik, USDA-ARS, and Teddy Garcia-Aroca, Louisiana State University, for their service as the 2020–2021 APS-SD immediate past president and graduate student representative, respectively.

Despite the challenges experienced by many division members due to the unusual winter weather occurring across portions of the Southern Division states, the first APS-SD Virtual Meeting was a success. We look forward, however, to hopefully being able to meet together as a division in person in 2022 in Chattanooga, TN. ■

People

Awards

Two Kansas State University faculty members from the College of Agriculture have each received a $5,000 award in recognition of their outstanding teaching and research. The annual Dr. Ron and Rae Iman Outstanding Faculty Awards are sponsored by the K-State Alumni Association and are made possible through the generosity of **Ron** and **Rae Iman**.

Kimberly A. Williams, professor and university distinguished teaching scholar of horticulture and natural resources, received the Iman Outstanding Faculty Award for Teaching. This award honors a full-time K-State faculty member for excellence in high-quality instruction, strong relationships with students inside and outside the classroom, and a reputation for scholarship and distinguished service to the university. Williams instructs five undergraduate courses that are known for their extensive experiential, problem-based learning.

Barbara Valent, professor of plant pathology, received the Iman Outstanding Faculty Award for Research. This award recognizes faculty members who have distinguished themselves in their chosen profession and contributed significantly through research to improve the betterment of the educational experience or whose research has had a significant impact on their area of study. Valent has become internationally recognized for her rice blast research and has played a leading role in developing rice blast as a model system for plant pathology, with specific contributions to understanding how the fungus causes disease and how it rapidly evolves to defeat resistance. Since 2009, she has also focused on wheat blast, which is caused by a newly emerged fungal variant that is threatening global wheat production.

Degrees

Shimul Das recently completed the requirements for a Ph.D. degree in plant pathology at Washington State University (WSU). His dissertation was titled "Characterization of Viruses in Legume Vegetables and Identification of Aphid Resistance in Lentil Germplasm." His thesis committee was led by **Naidu Rayapati** and **Lyndon Porter** and included **Gary Gove** and **Scott Harper**. Das received his bachelor's (honors) degree in agriculture, majoring in entomology, in 2008 from Khulna University, Bangladesh, and master's degree in entomology, majoring in insect ecology and pest management, in 2010 from Bangladesh Agricultural University. In 2011, he joined Khulna University as a faculty lecturer in agrotechnology and was promoted to assistant professor in 2013. Das came to Rayapati's lab in the Department of Plant Pathology, WSU, in spring 2016 as a BHEARD (Borlaug Higher Education for Agricultural Research and Development) fellow funded by USAID Bangladesh. Since he recently returned to Khulna University, he has been promoted to associate professor and is actively involved in teaching, research, and grant management. He has been working on a research project titled "Detection and Metagenomic Analysis of *Chili leaf curl virus* Infecting Chili Extensively Grown in Bangladesh" that is funded by the Ministry of Science and Technology and Ministry of Education, Government of the People's Republic of Bangladesh. His goal is to utilize his advanced knowledge of plant virology acquired from WSU to address local and national viral disease problems of Bangladesh with national and international collaborations.

Christine Jade Dilla-Ermita recently completed the requirements for a Ph.D. degree in plant pathology at Washington State University (WSU). Her dissertation was titled "Wheat enotype-Specific Recruitment of Rhizosphere Microbiomes That Are Suppressive to Rhizoctonia Root Rot." Her thesis committee was led by **Scot Hulbert** and included **Tarah Sullivan**, **Cynthia Gleason**, **Tim Paulitz**, and **Kim Campbell**. Dilla-Ermita received her B.S. degree in agriculture, majoring in plant pathology, in 2004 and M.S. degree in genetics in 2013 from the University of the Philippines Los Baños, Philippines. Before coming to WSU in 2016, she was a research associate in the Department of Plant Pathology (October to November 2004) and in the Institute of Plant Breeding (November 2004 to September 2005) in the University of the Philippines Los Baños; science research specialist in the Philippine Rice Research Institute, Muñoz (October 2005 to March 2008); and researcher (May 2008 to August 2010), assistant scientist (September 2010 to June 2014), and associate scientist (July 2014 to July 2016) in the Plant Breeding, Genetics and Biotechnology Division, International Rice Research Institute (IRRI), Los Baños, Philippines. Dilla-Ermita received the IRRI Outstanding Research Support Team Award in 2013 and International Young Rice Scientist

People, continued on page 15

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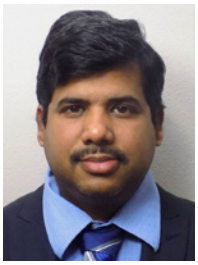
Award in 2014. At WSU, she received the Lindahl Memorial Scholarship (2017–2018), Everett and Helen Kreizinger Scholarship (2019–2021), and Martin Stoner Memorial Student Scholarship (2021). In July 2021, she will start her postdoctoral research on molecular interactions between pathogenic strains of *Macrophomina phaseolina* and different strawberry varieties under the supervision of **Steven Knapp** at the University of California, Davis, and **Peter Henry**, USDA-ARS.

New Position



Ashish Ranjan joined the Department of Plant Pathology, University of Minnesota–St. Paul as a research assistant professor in November 2020. Ranjan received his Ph.D. degree in plant–microbe interactions at the Centre for Cellular and Molecular Biology, University Hyberabad, Telangana, India. Through his Ph.D. studies, Ranjan discovered that treating rice with cell wall-degrading enzymes could up-regulate rice receptor-like kinase, WALL-ASSOCIATED-LIKE21, and the jasmonic defense pathway, leading to enhanced innate immunity to *Xanthomonas oryzae* pv. *oryzae*. Dr. Ranjan then joined the University of Wisconsin as a postdoctoral researcher studying disease resistance mechanisms and pathogenicity factors involved in the soybean and *Sclerotinia sclerotiorum* pathosystem. This work resulted in the identification of tolerant soybean lines, understanding the molecular mechanisms of resistance, and utilizing siRNA and gene-editing to down-regulate soybean genes that result in enhanced resistance. In his new position at the University of Minnesota, Ranjan plans to continue conducting research on plant–microbe interactions that can be leveraged to improve agriculture in Minnesota and around the world. Building on his expertise in soybean and *S. sclerotiorum*, he plans to address Sclerotinia stem rot in soybean, canola, and sunflower through examining host diversity in resistance, the role of the microbiome in *S. sclerotiorum* infection, and population genomics of the pathogen to identify virulence factors and biological controls. His overall research goal is to help farmers and growers find solutions to diseases of economically important crops. In addition, Ranjan will be involved in teaching the plant–microbe interactions course in the department.

Obituary

Dr. Larry J. Littlefield was born in Fort Smith, AR, and grew up on a farm in La Flore County, Oklahoma. He received his B.S. degree in agriculture/plant science from Cornell University in 1960, and his M.S. and Ph.D. degrees in plant pathology (with a botany minor) from the University of Minnesota. Dr. Littlefield married his wife **Julie** in 1963 in Minneapolis, and they have three children: **David**, **Sarah**, and **Annie Littlefield**.

Dr. Littlefield spent a postdoctoral year at Uppsala, Sweden, before becoming an assistant professor in plant pathology at North Dakota State University (NDSU), Fargo, in 1965. There, his research focused on the anatomy and histology of flax rust and *Barley stripe mosaic virus* and on biocontrol of weeds. He coauthored the book *Ultrastructure of Rust Fungi* with **Michele C. Heath** in 1979 and was sole author of *Biology of the Plant Rusts: An Introduction*, published in 1981. Always an excellent teacher, he taught both mycology and introductory plant pathology. From 1980 to 1982, he took a leave of absence from NDSU to work at the USDA Office of International Cooperation and Development in Washington, DC, where his work focused on international training activities in the United States for AID-sponsored participants.

In 1985 Dr. Littlefield moved into a leadership role at Oklahoma State University, where he served as professor and head of the Department of Plant Pathology. As department head he worked closely with the Oklahoma Peanut Commission on research and extension programs and with the Oklahoma Department of Agriculture to draft legislation regulating biotechnology research in the state. He also was active in the university's international programs, in which he helped formulate and implement in-service training and continuing education programs for Pakistani agricultural scientists, and served on the College of Agriculture Core Curriculum Task Force. In 1996, Larry returned to full-time research and teaching at OSU, returning to his early-career fascination with fungal ultrastructure by studying *Polymyxa graminis*, the fungal vector of *Soilborne wheat mosaic virus*, and the biology and ultrastructure of *Puccinia carduorum*, a rust fungus potentially useful as a biological control for musk thistle. He also taught Introductory Plant Pathology.

As a researcher and mycologist Dr. Littlefield was admired and respected worldwide for his pioneering approaches to understanding the rust fungi through their ultrastructure. A close colleague observed: "Spanning the different segments of his career, Dr. Littlefield was one of a very small group of plant pathologists who pioneered the use of light and electron microscopy to investigate the development of obligate parasites, such as the rust fungi, in their plant hosts. This work was the keystone to understanding the complexity and cell biology of how this important group of plant pathogens develop in, and interact with, plants at the cellular level."

Dr. Littlefield retired from OSU in June 2004, and he and Julie moved to Albuquerque, NM. Larry quickly became engaged in local activities, including hiking and photography, visiting and volunteering at art and science museums and the Albuquerque BIoPark, and attending concerts and plays. Larry also volunteered with the U.S. Forest Service in New Mexico, initially helping with trail maintenance. That service led to one of the most iconic activities of his retired life: becoming a New Mexico "wildflower guru," he led wildflower hikes and scoured the mountains of northern and central New Mexico to learn and photograph the remarkable diversity of flowering plants. The resulting guidebooks, *Wildflowers of the Sandia and Manzano Mountains of Central New Mexico* (2011) and *Wildflowers of the Northern and Central Mountains of New Mexico* (2015), both coauthored with fellow wildflower specialist **Pearl M. Burns**, were unique among field guides in that they present the biophysical characteristics of various wildflower environments and how they influence the occurrence and location of each species. In 2019 Larry and Julie moved to Seattle, WA, where he passed away on April 19, 2021, after a short illness.

Seminar

Yazmin Rivera, assistant laboratory director of science and technology, Beltsville Laboratory, USDA-APHIS PPQ, was invited to present a seminar titled "Adapting New Technologies for the Molecular Diagnostics of High Consequence and Regulatory Plant Pathogens" to the Department of Plant Pathology, Washington State University (WSU), on March 15, 2021. Rivera obtained her doctoral degree from SUNY-College of Environmental Sciences and Forestry, and her M.S.

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and B.S. degrees from the University of Puerto Rico-Mayaguez Campus in her native Puerto Rico. She is currently leading the Methods Development Team. She has led projects using high-throughput sequencing (HTS) as a diagnostic tool for virus detection and generation of whole genomes through HTS to support plant pathogen diagnostic method development and evaluation. She has participated on national and international efforts to standardize protocols and guidelines for using HTS as a diagnostic tool for plant virus detection. Before joining PPQ, Rivera worked as a postdoctoral intern in the Integrated Clinical, Extension, Research and Regulatory Program, gaining experience in plant pathogen diagnostics, extension education, and identification of PPQ-intercepted fungi. Her research as a postdoctoral research associate at USDA-ARS involved the use of genomics for studying the population genetics of downy mildew pathogens of ornamental plants and boxwood blight fungi. She served on the APS Public Policy Board for 2 years. **Hanu Pappu**, professor in the WSU Department of Plant Pathology, coordinated the virtual seminar, which was well attended by graduate students, postdocs, and faculty. ■

Graduate Student Spotlight: Katrin Ayer

What type of degree program are you enrolled in?

Ph.D., Cornell University.

What year are you in graduate school?

I am currently a fifth-year student, with an expected graduation date of August 2021.

What is your academic department/section called at your institution?

Plant Pathology and Plant-Microbe Biology.

Who is your major professor?

Dr. Kerik Cox.

Are you an APS member?

Yes.

How have you been involved in the APS organization?

I have enjoyed attending and presenting my research at the past five APS Annual Meetings. I've also moderated sessions and been a part of the Graduate Student Committee.

Please provide a brief description of your research.

I study management of apple scab with succinate dehydrogenase inhibitors (SDHIs). I am specifically focusing on the development of fungicide resistance and increasing sustainability of management practices.

What's something interesting most people don't know about you?

When I was an undergrad, I lived in Mendoza, Argentina, for five months. While there, I got to visit Patagonia, as well as some other incredible places.

What are some of your interests outside of science?

In my free time, I love taking advantage of the beautiful area of the Finger Lakes, from running the trails to hiking the gorges, enjoying the lakes, and sipping wines from the region.

What is your hometown?

Farmington, CT, USA.

What is your favorite pathogen/plant disease?

Cedar apple rust (sorry apple scab).

If you know you are pursuing a specific career sector, what is it?

I am interested in pursuing a career in industry.

How did you become interested in the field of plant pathology?

I did an undergraduate summer internship in plant pathology at Cornell, and I've been hooked ever since.

Do you have any social media handles that you want to share?

E-mail: kma86@cornell.edu
Twitter: @ayer_katrin ■

Learn more about the APS Graduate Student Committee initiatives and student opportunities. Connect with the committee on Twitter @plantpathgrads and Facebook.

Fungicide Discovery Scientist

Enko (Mystic, Connecticut)

The successful candidate will have demonstrated the ability to thrive in a dynamic, fast-paced, and innovative environment. Excellent written and oral communication skills are required, as is the desire and ability to excel in a multidisciplinary environment. As an early member of the R&D team, this person will have an opportunity to help establish a culture that nurtures scientific excellence, a sense of urgency to achieve project success, and success built on collaboration and personal accountability.

Major Responsibilities Include:

- Apply knowledge of market-leading products and the attributes of highly effective fungicides to define characterization strategies that support advancement of chemistries through the staging system.
- Lead the design and implementation of robust assays for characterization of candidate chemistries on model and agronomically important plant pathogens.
- Collaborate with a diverse team of scientists to identify and validate targets and optimize lead chemistries, creating a pipeline of product candidates.
- Collaborate with external partners to conduct advanced characterization of candidate molecules.
- Collaborate as a member of the Biology Leadership Team to develop approaches for rapidly and reliably advancing candidate molecules through a tiered evaluation system.

The ideal candidate will have demonstrated an ability to apply their expertise in fungicide discovery to advance small molecule discovery campaigns from screening to identification of development candidates. They will have a deep understanding of the discovery process and be able to translate this to the development of a tiered evaluation system for fungicides.

Qualifications and Skills:

- Ph.D. in plant pathology or a related discipline.
- A minimum of 5 years of experience in the discovery of fungicides, including direct involvement in the characterization of early-stage chemistries in the lab and greenhouse. A working knowledge of the characterization of crop protection chemistries in the field is desirable.
- Experience in utilizing data-driven decision making to advance chemistries in a staged, pipeline management system.
- Demonstration of scientific and team leadership. Excellent written and oral communication.
- Experience building teams and research infrastructure, as well as establishing and managing external research collaborations provides a distinct advantage.
- Understanding of the properties necessary in a small molecule fungicide and a working knowledge of organic chemistry necessary to contribute to a multidisciplinary team.
- Experience working in a multidisciplinary team environment.

Research Associate in Molecular Plant–Microbe Interactions

USDA-ARS DBNRRC (Stuttgart, Arkansas)

Postdoctoral Research Associate at USDA-ARS Dale Bumpers National Rice Research Center, Stuttgart, AR, for work on a recently funded NSF project examining the evolution of competitiveness in weedy rice, a major agricultural weed (IOS-1947609). The position will investigate plant-adaptive innate immunity and host–pathogen interactions in weedy rice. Techniques will include the following: biochemical, molecular pathological experiments, including yeast two hybrid and biomolecular fluorescence complementation assays; data analysis of disease reactions of rice mapping populations and differential rice genotypes and their relation to SNP and indel variation in differential blast races; development of user-friendly DNA markers for resistance gene candidates; functional validation of the candidate genes in disease resistance using real-time PCR and qRT-PCR; transformation of the candidate avirulence genes by fungal transformation; prepare manuscripts. Ph.D. in plant pathology, biochemistry, biology, agronomy, or related areas is required. This position is planned for 3 years upon satisfaction of annual evaluation. The position is funded through Washington University in St. Louis (job ID 47428). For details please contact **Dr. Yulin Jia**.

Research Associate in Plant Pathogen Diagnostics at Virginia Tech's Alson H. Smith, Jr. AREC

Virginia Polytechnic Institute and State University (Winchester, Virginia)

This individual will conduct laboratory-based basic and applied research on new assays for rapid on-site plant pathogen diagnostics and lab-based infective propagule quantification; development of molecular diagnostic assays for detecting and quantifying antibiotic/fungicide resistance mutations in real time; design, optimize, and validate novel plant pathogen diagnostic and quantification assays using isothermal PCR, classic PCR, chip technologies, ddPCR, qRT-PCR, or other similar DNA or RNA platforms or electromagnetic bead technologies—all directed toward plant pathogens of apples and stone fruits (bacteria, fungi, viruses). The successful candidate is expected to independently design, organize, and manage lab experiments, budget and order supplies, optimize DNA and RNA diagnostic and quantitative protocols, gene expression, conduct DNA/RNA extractions and experimental trials, or any other closely associated tasks related to this research. The candidate is expected to begin new laboratory experiments (including assay validation) for internal and future sponsored research projects under the direction of the project leader, **Dr. Srđan Aćimović**.

The candidate will also be responsible for writing grant proposals, monitoring budget spending, preparing progress reports, collecting and analyzing research findings, presenting in professional meetings, and writing research and extension publications. The individual is also expected to mentor graduate students, supervise technicians and staff, and collaborate with faculty and scientists at Virginia Tech and other research institutes. This is a 1-year position that is renewable, contingent on performance and available funding.

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Classifieds, continued from page 17

Required Qualifications

- Master's degree in molecular biology, biotechnology, microbiology, molecular plant pathology, biomedical sciences, or plant or microbial science-related field.
- Strong scientific writing skills.
- Good statistical analysis skills.
- Skills with microorganism manipulation in vitro and in vivo.

Preferred Qualifications

- Ph.D. degree in molecular biology, biotechnology, microbiology, molecular plant pathology, biomedical sciences, or plant or microbial science-related field.
- Research experience in diagnostic assays for microorganisms.
- Familiarity with basic cell and molecular biology techniques, including DNA/RNA manipulation, gene and genome sequencing, microscopy, nucleic acid extraction, cloning, and gene expression analysis.
- Grant-writing experience and research publication record in pathogen diagnostics and quantification sphere.

Appointment Type: Restricted

Salary Information: Commensurate with Qualifications

Review Date: May 28, 2021

Additional Information

- The successful candidate will be required to have a criminal conviction check.
- Must have a driver's license check.
- Must have an acceptable and safe driving record.

About Virginia Tech

Dedicated to its motto, *Ut Prosim* (That I May Serve), Virginia Tech pushes the boundaries of knowledge by taking a hands-on, transdisciplinary approach to preparing scholars to be leaders and problem solvers. A comprehensive land-grant institution that enhances the quality of life in Virginia and throughout the world, Virginia Tech is an inclusive community dedicated to knowledge, discovery, and creativity. The university offers more than 280 majors to a diverse enrollment of more than 36,000 undergraduate, graduate, and professional students in 8 undergraduate colleges, a school of medicine, a veterinary medicine college, Graduate School, and Honors College. The university has a significant presence across Virginia, including the Innovation Campus in northern Virginia; the Health Sciences and Technology Campus in Roanoke; sites in Newport News and Richmond; and numerous extension offices and research centers. A leading global research institution, Virginia Tech conducts more than $500 million in research annually.

Virginia Tech does not discriminate against employees, students, or applicants on the basis of age, color, disability, sex (including pregnancy), gender, gender identity, gender expression, genetic information, national origin, political affiliation, race, religion, sexual orientation, or veteran status, or otherwise discriminate against employees or applicants who inquire about, discuss, or disclose their compensation or the compensation of other employees or applicants, or on any other basis protected by law.

If you are an individual with a disability and desire an accommodation, please contact **Anthony Wolf** during regular business hours at least 10 business days prior to the event.

Advertised: May 6, 2021

Applications close: Open until filled

Research Plant Pathologist
USDA-ARS NCSL (Fargo, North Dakota)

This position is located at the U.S. Department of Agriculture (USDA), Agricultural Research Services (ARS), Sugarbeet and Potato Research Unit, in Fargo, ND.

The incumbent contributes expertise on a research assignment focused on the epidemiology, population genetics, or population genomics of important diseases of sugarbeet that impact yield, postharvest storage-related characteristics, or marketability. The ideal candidate will have a background in genome-enabled epidemiology that can be used to advance our understanding of the factors underlying important diseases of sugarbeet, including Cercospora leaf spot.

Responsibilities

- Contributes expertise on a research assignment focused on the epidemiology, population genetics, or population genomics of important diseases of sugarbeet that impact yield, postharvest storage-related characteristics, or marketability.
- Works independently but coordinates research activities with other scientists in the unit and plant pathologists at North Dakota State University to improve sugarbeet production and to develop basic information on sugarbeet diseases.
- Identifies critical industry problems, conceives research to solve these problems, develops feasible project objectives and approaches, and initiates independent or necessary cooperative efforts for the projects.
- Supports ARS National Program (NP) 301 Plant Genetic Resources, Genomics, and Genetic Improvement. ■

Calendar

APS-SPONSORED EVENTS

JUNE 2021

APS Pacific Division Meeting
APS North Central Division Meeting

AUGUST 2021

Plant Health 2021 Online

SEPTEMBER 2021

APS Caribbean Division Meeting

Research Notebook

SPOTLIGHT

Now Available! The Phytobiomes of Bioenergy Crops and Agroecosystems Focus Issue

The *Phytobiomes Journal*'s first focus issue highlights research aimed at understanding and harnessing the phytobiomes associated with bioenergy crops. Explore the issue and learn more about increasing productivity and sustainability in bioenergy crops.

Submit Your Research to the *MPMI* Focus Issue by July 24, 2021!

Focus Issue Editors **Jacquie Bede**, **Kenichi Tsuda**, and **Jeanne Harris** invite research and review papers that explore the complex interactions between plants, microbes, and the abiotic environment.

Deadline Approaching! Be Included in the 2022 *Phytopathology* Focus Issue

Given their growing economic importance, broad impact on plant pathology, and potential importance to better management based on new knowledge of *Ca.* Liberibacter–plant–insect interactions, *Phytopathology* has selected *Ca.* Liberibacter pathosystems as the topic for its January 2022 Focus Issue. Submit your research by June 15, 2021.

New Technology Enables Rapid Sequencing of Entire Genomes of Plant Pathogens

A recently published *Plant Health Progress* paper discusses the efficacy of Oxford Nanopore Technologies protocols, which have the ability to prepare RNA and DNA libraries from virus-infected plant material and from a plant-pathogenic bacterium, respectively. After 1 h of data sequencing, scientists had enough data to assemble small genomes. ■

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TRENDING

Phytopathology

A Lipid Transfer Protein Has Antifungal and Antioxidant Activity and Suppresses Fusarium Head Blight Disease and DON Accumulation in Transgenic Wheat
J. E. McLaughlin, N. I. Darwish, J. Garcia-Sanchez, N. Tyagi, H. N. Trick, S. McCormick, et al.

The Role of ATP-Binding Cassette Transporters in Bacterial Phytopathogenesis
Y. Zeng and A. O. Charkowski

The Complete Genome Sequence of *Xanthomonas theicola*, the Causal Agent of Canker on Tea Plants, Reveals Novel Secretion Systems in Clade-1 Xanthomonads
R. Koebnik, D. Burokiene, C. Bragard, C. Chang, M. Fischer-Le Saux, R. Kölliker, et al.

Plant Disease

Saccharin Provides Protection and Activates Defense Mechanisms in Wheat Against the Hemibiotrophic Pathogen *Zymoseptoria tritici*
S. Mejri, M. Magnin-Robert, B. Randoux, A. Ghinet, P. Halama, A. Siah, and P. Reignault

Molecular Diversity and Pathogenicity of *Ralstonia solanacearum* Species Complex Associated with Bacterial Wilt of Potato in Rwanda
K. Sharma, J. Kreuze, A. Abdurahman, M. Parker, A. Nduwayezu, and P. Rukundo

Resistance to Potassium Phosphite in *Phytophthora* Species Causing Citrus Brown Rot and Integrated Practices for Management of Resistant Isolates
W. Hao, H. Förster, and J. E. Adaskaveg

MPMI

AlgU, a Conserved Sigma Factor Regulating Abiotic Stress Tolerance and Promoting Virulence in *Pseudomonas syringae*
H. Wang, Z. Yang, B. Swingle, and B. H. Kvitko

The CHY-Type Zinc Finger Protein FgChy1 Regulates Polarized Growth, Pathogenicity, and Microtubule Assembly in *Fusarium graminearum*
S. Cao, W. Li, C. Li, G. Wang, W. Jiang, H. Sun, et al.

Identification of a Putative DNA-Binding Protein in *Arabidopsis* That Acts as a Susceptibility Hub and Interacts with Multiple *Pseudomonas syringae* Effectors
K. J. Schreiber and J. D. Lewis

Plant Health Progress

Comparison of Nanopore Sequencing Protocols and Real-Time Analysis for Phytopathogen Diagnostics
T. Phannareth, S. O. Nunziata, M. J. Stulberg, M. E. Galvez, and Y. Rivera

Evolving Plant Diagnostics During a Pandemic
A. Smart, J. Byrne, R. Hammerschmidt, K. L. Snover-Clift, J. P. Stack, T. Brenes-Arguedas, J. B. Jones, and C. L. Harmon

Fungi Associated with Garlic During the Cropping Season, with Focus on *Fusarium proliferatum* and *F. oxysporum*
L. Mondani, G. Chiusa, and P. Battilani

Phytobiomes

Intraspecific Variability in Root Traits and Edaphic Conditions Influence Soil Microbiomes across 12 Switchgrass Cultivars
T. C. Ulbrich, M. L. Friesen, S. S. Roley, L. K. Tiemann, and S. E. Evans

Managing Plant Microbiomes for Sustainable Biofuel Production
K. Zhalnina, C. Hawkes, A. Shade, M. K. Firestone, and J. Pett-Ridge

The Switchgrass Microbiome: A Review of Structure, Function, and Taxonomic Distribution
R. Hestrin, M. R. Lee, B. K. Whitaker, and J. Pett-Ridge

PhytoFrontiers™

High-Quality Genome Resource of the Pathogen of *Botryosphaeria dothidea* Causing Kiwifruit Soft Rot
K. Liang, J. Lan, B. Wang, Y. Liu, Q. Lu, and P. Liu

Mitochondrial Genome Resource of *Phomopsis longicolla*, a Fungus Causing Phomopsis Seed Decay in Soybean
S. Li and Y. Deng ■

= *Editor's Pick* = *Open*