Station News

The Connecticut Agricultural Experiment Station
Volume 8 Issue 5 May 2018

The mission of The Connecticut Agricultural Experiment Station is to develop, advance, and disseminate scientific knowledge, improve agricultural productivity and environmental quality, protect plants, and enhance human health and well-being through research for the benefit of Connecticut residents and the nation. Seeking solutions across a variety of disciplines for the benefit of urban, suburban, and rural communities, Station scientists remain committed to "Putting Science to Work for Society", a motto as relevant today as it was at our founding in 1875.

CAES

The Connecticut Agricultural Experiment Station

Putting Science to Work for Society since 1875

This Issue

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STATION NEWS

GOVERNOR MALLOY ATTENDS BOARD OF CONTROL MEETING

On April 11, Governor Dannel P. Malloy presided over a statutory meeting of the Experiment Station's Board of Control, the first governor to do so in nearly 80 years. The meeting was held in the Slate Board Room and in attendance were Board Members: Dr. Theodore Andreadis (Director CAES), Mr. Terry Jones (Vice President, Governor appointee), Mr. Paul Larson (Secretary, appointee of the University of Connecticut), Dr. Erol Fikrig (appointee of Yale University), Ms. Joan Nichols (Governor appointee), Mr. Steven Reviczky (Commissioner of Agriculture), Dr. Dana Royer (appointee of Wesleyan University), and Ms. Patti Maroney (Governor representative). Also present by invitation were Dr. Jason White, Mr. Michael Last, Dr. Lindsay Triplett, and Dr. Teja Shidore.

The Governor and members of the Board of Control toured the Jenkins-Waggoner Laboratory with stops at the laboratories of Dr. Lindsay Triplett and Dr. Kimberly Stoner for research updates in plant pathology and pollinator research. Dr. Wade Elmer and Dr. Kimberly Stoner also provided overviews of the Plant Disease and Insect Information Offices.

Following the tour, the Governor opened the Board meeting and Vice President Mr. Terry Jones read the following official statement:

> *Governor Malloy, on behalf of The Connecticut Agricultural Experiment Station (the first such station in the United States), I would like to state for the record this board has profound appreciation for your steadfast support of CAES throughout your two terms of office.*
>
> *During that time, a few highlights include completion of our Griswold Field Laboratory and the renovation and expansion of the Jenkins-Waggoner building in New Haven. We also are very excited for your commitment to moving forward on renovating and expanding our Valley Laboratory in Windsor.*
>
> *Most recently, your support to refill two, critically-important scientist positions - fruit virologist and food chemist - is a strategic boost to our long range sustainability.*
>
> *Thank you for believing in and helping us fulfill our mission: "Putting science to work for society, protecting agriculture/public health and the environment."*
>
> *Lastly, we appreciate your presence at this board meeting. We believe it is an historic event worth noting since, to the best of our knowledge, it has been 70-80 years since a governor has presided here.*

Dr. Andreadis also thanked the Governor for attending the meeting and his support of The Connecticut Agricultural Experiment Station during his tenure as Governor, especially during this challenging economic period in the State.

Governor Malloy thanked the Board of Control members and the staff of The Connecticut Agricultural Experiment Station for the good work they perform on behalf of the citizens of Connecticut.

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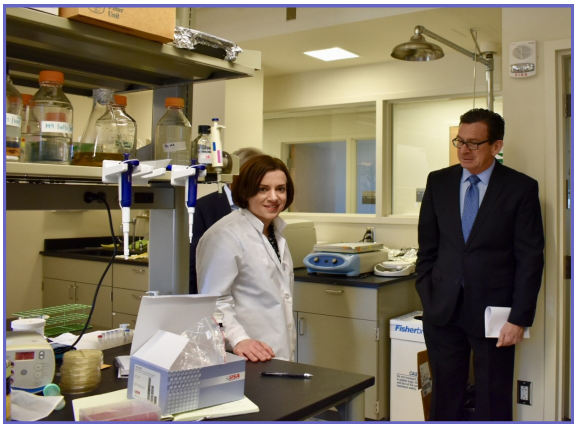

ADMINISTRATION

DR. THEODORE ANDREADIS participated in a press conference held at the Station with US Senator Richard Blumenthal concerning ticks and the rising incidence of tick-borne diseases in Connecticut (April 4); hosted Governor Dannel Malloy and presided over a quarterly meeting of the Station's Board of Control held at the Station (April 11); presented welcoming remarks and an update on Experiment Station activities at the Annual Meeting of the Experiment Station Associates held at the Station (April 11); and participated in a meeting of principal investigators of the five Regional Centers of Excellence in Vector-Borne Diseases held at the Centers for Disease Control and Prevention Division of Vector-Borne Diseases in Fort Collins, CO (April 18-19).

ANALYTICAL CHEMISTRY

DR. JASON C. WHITE gave an oral presentation at the Stockbridge School of Agriculture at UMass Amherst entitled "Nanomaterials and the food supply: Assessing the balance between applications and implications" (25 attendees) (April 2); attended the Laboratory Preparedness Advisory Group monthly meeting at the CT DPH Laboratory in Rocky Hill (April 2); along with **MR. CRAIG MUSANTE**, **MS. KITTY PRAPAYOTIN-RIVEROS, DR. BRIAN EITZER, MS. TERRI ARSENAULT, DR. NUBIA ZUVERZA-MENA, DR. CHRISTINA ROBB, MR. JOHN RANCIATO** and **MR. MICHAEL AMMIRATA,** attended training on ISO/IEC 17025:2017 - The New Standard for Laboratory Competence given by Susan Audino from A2LA (April 3-4); participated in a WebEx meeting with collaborators from the Center for Sustainable Nanotechnology regarding preparation of a collaborative publication (April 6); participated in a professional development WebEx presentation for trainees of the Center for Sustainable Nanotechnology that was focused on ethical conduct of science (April 6); along with **DR. ROBERTO DE LA TORRE-ROCHE** and **DR. NUBIA ZUVERZA-MENA** hosted an undergraduate student from Muhlenberg College that conducted analysis of samples as part of a collaborative research project (April 9-10); participated in a Skype call with collaborators from the University of Parma regarding a graduate student 6-month laboratory exchange in the Department of Analytical Chemistry (April 10); participated in an FDA WebEx training on completing grant reporting requirements in eRA Commons (April 10); participated in a conference call with collaborators at Carnegie Mellon University, the University of Texas El Paso, and the University of California Santa Barbara regarding an upcoming NSF Center Grant application (April 12); along with **DR. BRIAN EITZER, MS. TERRI ARSENAULT** and **DR. CHRISTINA ROBB,** attended the FDA FERN cCAP 2018 Technical Conference in Baltimore, MD (April 17-18); participated in a ZOOM investigator annual review with senior staff at the Center for Sustainable Nanotechnology (April 19); participated in a ZOOM meeting with Professor Franz Geiger of Northwestern University regarding collaborative experiments (April 20); participated in an initial planning call for the upcoming Center for Sustainable Nanotechnology "All Hands" meeting, which is being held at CAES in September (April 20); along with **MS. TERRI ARSENAULT** participated in a CT National Guard 14th Civil Support Team and FBI WMD chemical terrorism training exercise (April 26); hosted a bi-weekly Center for Sustainable Nanotechnology ZOOM meeting on nano-enabled agriculture (April 30); and along with all Department Staff, began hosting Ms. Clarisse Liné of EcoLab in Toulouse, France for a two month visit (April 30).

DR. BRIAN EITZER gave an oral presentation entitled "FERN Screening Methods: How to Find Them and Out Them Into Use" with co-author **MS. TERRI ARSENAULT** at the FDA FERN cCAP 2018 Technical Conference in Baltimore, MD (40 attendees) (April 17-18).

DR. CHRISTINA ROBB gave an oral presentation entitled "Plates to Peaks: A Proposal to move ELISA to the LC-MS platform" with co-author **DR. WALTER KROL** at the FDA FERN cCAP 2018 Technical Conference in Baltimore, MD (40 attendees) (April 17-18) and participated in the FERN Northeast Teleconference (April 26); and participated in the eLEXNET: Reporting and Analytics (iDAT) Training (April 26).

DR. WALTER KROL presented a talk entitled "Pesticide Residues in Food Sold in Connecticut" at Albertus Magnus College in New Haven (25 attendees) (April 20) and served as Judge at the Sigma Xi Quinnipiac Chapter Seventh Annual Student Research Conference held at Quinnipiac College (40 attendees) (April 26).

ENTOMOLOGY

DR. KIRBY C. STAFFORD III was interviewed by Jordan Otero Sisson about a report of stolen honey bee hives in Sprague (April 2); presented the welcome and participated in the 93rd annual meeting of the Eastern Plant Board (EPB) held at the Mystic Hilton (April 9-12); and was visited by Dr. Andrew Li and Laura Beimfohr, USDA-ARS (April 17-18) and Chris Przybyszewski, U.S. Biologic, Inc. (April 18) to discuss future tick research plans.

MS. KATHERINE DUGAS, with **MR. JEFFREY FENGLER**, **DR. VICTORIA SMITH**, and **MS. TIA BLEVINS**, hosted and attended the combined meeting of the Eastern Plant Board, the Horticultural Inspection Society, and the Cooperative Agricultural Pest Survey, held in Mystic, CT (90 participants) (April 9-12); staffed a Forest Pest Outreach booth at North Haven Earth Day (approximately 90 people stopped by the booth) (April 7); staffed a Forest Pest Outreach booth at Hamden Earth Day with (approximately 128 people stopping by the booth) (April 21); and gave a talk about Gypsy moths at the Duck River Garden Club in Old Lyme (30 attendees) (April 23).

MR. MARK H. CREIGHTON presented a bee talk on caring for bees in the spring, at Shag Bark Supply in East Haddam (20 beekeepers attended) (April 14); reestablished the apiary at Yale Farm in New Haven; the apiary will also be used as a pilot program for disadvantaged youth under development at Yale University (April 17); and spoke to 360 students at Ridgefield Elementary School on honey bees. The students were able to view live honey bees in our educational observation hive and learn about pollination (April 23).

DR. MEGAN LINSKE attended the Northeast Section of the Wildlife Society's (NETWS) Workshop Committee conference call for the Northeast Association of Fish and Wildlife Agencies (NEAFWA) conference (April 4); ran two professional development workshops at the NEAFWA conference titled "Q & A about Q & A: Designing effective human dimensions research tools and getting the most from the data" (13 attendees) and "Use of unmanned aerial vehicles for wildlife research and monitoring" (13 attendees) (April 15); attended the NETWS Executive Meeting (April 15); transitioned

into the Executive Secretary position of NETWS at the annual members meeting (April 16); gave an invited lecture for the One Health Practice and Wildlife Management Symposium at the NEAFWA conference (45 attendees) (April 17); participated in a joint meeting with USDA and US Biologic staff on current and future research projects and funding opportunities (April 19); participated in a conference call with CDC and US Biologic on ongoing and future research projects (April 24); judged students' presentations for Quinnipiac University's Sigma Xi Student Research Conference (April 26); and participated in the Northeast Regional Center for Excellence in Vector-Borne Diseases trainee seminar (April 30).

DR. GALE E. RIDGE, along with **DR. KIRBY STAFFORD**, attended the Capstone Scholars Day, at Quinnipiac University, North Haven to listen to student and staff presentations and to see our student's posters (April 6); presented a talk on Delusions of Parasitosis at a pest management conference in Marlborough, MA (65 attendees) (April 11); talked to visiting students from Norwalk Technical High School (Norwich, CT) who were very enthusiastic about every insect (10 students) (April 18); and was interviewed by CNBC TV about the Brown Marmorated Stink Bug in Connecticut (April 30).

DR. VICTORIA L. SMITH, with **MS. TIA BLEVINS**, **MS. KATHERINE DUGAS**, **MR. JEFFREY FENGLER**, and **MR. ZACHARY BROWN**, organized, hosted, and moderated the 93rd annual meeting of the Eastern Plant Board (EPB), the Horticultural Inspection Society (HIS), and the Cooperative Agricultural Pest Survey (CAPS), held at the Mystic Hilton (April 9-12). Ninety participants, representing the EPB, HIS, CAPS, USDA-Plant Protection and Quarantine, US Forest Service, and US Customs and Border Protection, attended meetings, presentations, and panel discussions on a wide range of topics. HIS members went on a field trip to Prides Corner Farms in Lebanon. Everyone enjoyed a New England lobster bake at the Mystic Aquarium.

DR. KIMBERLY A. STONER was interviewed by Hanna Holcomb for an article in Connecticut Woodlands magazine (April 6); met with Jackie Algon, Louise Washer, and Donna Merrill about the Wilton Pollinator Pathway program and how to best incorporate citizen science into the program (April 9); spoke at the Weston Library on "Planting for the Bees' Needs" as part of the launch of the Weston and Ridgefield Pollinator Pathway programs (45 attendees) (April 9); Governor Malloy and members of the Board of Control visited the Bee Lab and heard about the diversity of bees in Connecticut and current projects measuring pesticide exposure of honey bees through pollen (April 11); spoke at the annual meeting of the Burlington Land Trust on "Planting for the Bees' Needs" at the Whigville Grange. (35 attendees) (April 11); visited town-owned land in Wallingford, along with Diane Blais, Paula Rosado, and Greg Williams of the Natural Resources Conservation Service, and met with Mary Heffernon and other members of the Wallingford Conservation Commission about planting pollinator habitat on a 2-acre property (7 people present) (April 17); and spoke on "Integrating Pollinator Habitat into Your Farm" as part of the "Healthy Soils = Healthy Crops" workshop, organized by the Natural Resources Conservation Service and CT NOFA, at South Farm, Morris (76 attendees) (April 26).

MS. TRACY ZARRILLO gave a talk entitled "A Safe Haven for Pollinators: Creating a Backyard Oasis" for the Hamden Land Conservation Trust, held at Whitney Center in Hamden (30 attendees) (April 13).

ENVIRONMENTAL SCIENCES

DR. JOSEPH PIGNATELLO participated as a member of a review panel for the Helmholtz Center for Environmental Research (UFZ) in Leipzig, Germany (April 9-11) and met with Prof. Lionel Vayssieres, Director, International Research Center for Renewable Energy, Xi'an Jiaotong University, Xi'an, China at Yale (April 25).

DR. DOUG BRACKNEY gave a seminar at Quinnipiac University to students and faculty titled "Journey to transmission: an arbovirus tale" (approx. 70 students) (April 9).

MR. GREGORY BUGBEE, with **MS. SUMMER STEBBINS**, gave a seminar on invasive aquatic plants at Three Rivers Community College in Norwich. (approx. 40 attendees) (April 4); with **MR. MICHAEL CAVADINI**, proctored the Herpetology event at the Science Olympiad at Robbins Middle School in Farmington (approx. 40 attendees) (April 21); and with **MS. SUMMER STEBBINS**, reported on the 2017 Aquatic plant survey of Taunton Lake at the Newtown Public Library (approx. 20 attendees) (April 26).

DR. GILLIAN EASTWOOD gave a talk and led a discussion at the Indian Rock Nature Preserve on "Mosquitoes and ticks and vector-borne disease in Connecticut" as part of Environmental Learning Centers of Connecticut's monthly lecture series (8 attendees) (April 28).

DR. GOUDARZ MOLAEI was interviewed by News 8, WTNH, "Good news about tick season" broadcasted and posted online at http://www.wtnh.com/news/health/good-news-about-tick-season/1101837042 (April 4); was interviewed by Connecticut News 12 on the current status of tick activity and forecast for the upcoming season (April 4); and hosted a student group, "Youth Interns with Mr. Ian Grosfelt," at the CAES Tick Testing Laboratory (8 students) (April 18).

MR. JOHN SHEPARD presented an invited seminar "Mosquito and Tick-Borne Diseases in Connecticut" at the Annual Meeting of the Horticultural Inspection Society, Eastern Branch in Mystic (17 attendees) (April 10); participated in the Milford Health Department's kick-off event for their Mosquito Control Program and was interviewed by reporters from WFSB - 3, WTNH -8, WTIC – Fox 61, WVIT -30, News 12, and the Connecticut Post about the state Mosquito and Arbovirus Surveillance Program (April 18); and presented an invited seminar "Mosquito-Borne Diseases and Mosquitoes of Connecticut" at the Clarke Mosquito Control Workshop in Bridgeport (20 attendees) (April 19).

DR. BLAIRE STEVEN hosted a guest lecture at Southern Connecticut State University in the Plant Physiology class on the role of microorganisms in plant health and physiology (20 student attendees) (April 10); hosted students from Henry Abbott Technical School for a four week program on identification of antibiotic resistant bacteria in Connecticut soils (6 student attendees) (April 6-27); and was awarded an Adjunct Assistant Research Professor in the Department of Natural Resources and the Environment, University of Connecticut (April 19).

FORESTRY AND HORTICULTURE

DR. JEFFREY S. WARD gave an invited lecture entitled "Independent Effects of Invasive Shrubs and Deer Herbivory on Plant Community Dynamics and Forest Management Implications" for the Future of the Forest: Managing Change in Westchester County hosted by the Rockefeller Preserve in Pleasantville, NY (35 attendees) (April 7).

DR. ABIGAIL A. MAYNARD assisted students planting and transplanting seedlings in the greenhouse and garden at Hamden Hall Country Day School (48 students, 3 teachers) (April 2,5,16,25,30); advised Wesleyan University students about composting operation in Middletown (5 students) (April 3); discussed the New Crops Program at the Hope farm in Milford (April 24); and discussed the New Crops Program at Bishops in Guilford (April 26).

DR. SCOTT C. WILLIAMS participated in a conference call with US Biologic staff about ongoing collaborative research (April 2); attended the Executive Committee meeting of The Northeast Section of The Wildlife Society at the Northeast Association of Fish and Wildlife Agency's (NEAFWA) conference, Burlington, VT (April 15); was awarded the John Pearce Memorial Award for outstanding professional accomplishments in wildlife conservation in the Northeast by The Northeast Section of The Wildlife Society (April 16); attended the Annual Members meeting of The Northeast Section of The Wildlife Society and transitioned into Northeast Section President-Elect (April 16); gave an invited lecture titled "Charismatic and Complicit: Impacts of Increased Abundances of White-tailed Deer on Ticks and Tick-borne Diseases " at the One Health Symposium at the NEAFWA conference (45 attendees) (April 17); participated in a joint meeting with USDA and US Biologic staff on current and future research projects and funding opportunities, New Haven (April 19); participated in a conference call with CDC and US Biologic on ongoing and future research projects (April 24); spoke with Popular Science reporter Kate Baggaley about the positive relationship with blacklegged ticks and Japanese barberry (April 25); and presented a guest lecture titled "Tick-borne disease ecology: concerns for forest and public health alike" and visited with professors from the School of Biology and Ecology at the University of Maine, Orono (100 attendees) (April 26-28).

MR. JOSEPH P. BARSKY participated in the triennial review of the Middletown High School Regional Agriscience Program (April 25).

MR. MICHAEL R. SHORT attended the 74nd Annual Northeast Fish & Wildlife Conference in Burlington, VT where he presented a poster titled "Quantifying wild turkey (*Meleagris gallopavo*) annual productivity utilizing camera trap methodologies in Connecticut, USA," based on collaborative research with CT-DEEP-Wildlife Division (300 attendees) (April 15-17).

PLANT PATHOLOGY AND ECOLOGY

DR. WADE ELMER served on a Master's Thesis examination committee for Ms. Cora McGehee's Master defense at the University of Connecticut (April 5); met with State Forester, Dr. Jerry Milne, in the Naugatuck State Forest to discuss planting sites for hybrid chestnuts (April 10); gave a presentation to Governor Malloy and the Board of Control on the duties of the Plant Disease Information Office, (April 11); and gave a presentation to the Station Associates in Jones Auditorium on "Can nanoparticles be used to control plant diseases" (23 attendees) (April 11).

DR. YONGHAO LI participated in the CT Nurseryman's Foundation Scholarship Committee meeting and interviewed candidates for the scholarship, New Haven (April 4); presented 'Pruning 101' at the Cherry Brook Garden Club meeting in Canton (35 adults) (April 10); gave a talk titled "How to Start a Vegetable Garden" with community garden members in North Haven (17 adults) (April 11); and talked about the Plant Disease Information Office and Disease Diagnosis to Youth Interns with Mr. Ian Grosfelt in New Haven (6 youths and one adult) (April 18).

DR. NEIL SCHULTES gave a seminar entitled "Genetic Engineering in Agriculture" for a class in Plant Physiology at Southern Connecticut State University (20 attendees) (April 12); served on a Master's Thesis examination committee for Candace Alexander at the Department of Biology at Indiana Perdue University in Ft. Wayne, IN (April 13); and served as a Judge in the Sigma Xi Quinnipiac Chapter Seventh Annual Student Research Conference at Quinnipiac University (40 participants) (April 26).

DR. LINDSAY TRIPLETT served as a judge for undergraduate poster presentations at the Sigma Xi Quinnipiac Chapter Student Research Conference at Quinnipiac University (40 participants) (April 26).

DR. QUAN ZENG served as a judge for undergraduate poster presentations at the Sigma Xi Quinnipiac Chapter Student Research Conference at Quinnipiac University (40 participants) (April 26), and presented on behalf of CAES at the JAX/SCSU bioscience careers forum at Southern Connecticut State University (20 adults) (April 27).

VALLEY LABORATORY

DR. RICHARD COWLES presented "Pollinator health: What citizens can do" for the Windsor Conservation Commission, Windsor (17 attendees) (April 26).

MS. ROSE HISKES with **MR. THOMAS RATHIER**, assisted the Connecticut Tree Protective Association arborist certification students at the hands on night in Wallingford (33 attendees) (April 11); participated in the Symposium Planning Committee meeting of the Connecticut Invasive Plant Working Group in Windsor (April 19); and with MR. THOMAS RATHIER and DR. JATINDER AULAKH, taught a Private Applicator Pesticide Certificate Preparation Class to hops, tobacco, vegetable, and fruit growers (25 attendees) (April 12, 19, and 25).

DR. JAMES LAMONDIA conducted a boxwood blight training program for Prides Corner Farms (April 4).

DEPARTMENTAL RESEARCH UPDATES APRIL 2018

Anderson, J. F., Armstrong, P. M., Misencik, M. J., Bransfield, A. B., Andreadis, T. G., and **Molaei, G.** 2018. Seasonal distribution, blood feeding habits, and viruses of mosquitoes in an open-faced quarry in Connecticut, 2010 and 2011. *J. Amer. Mosq. Control Assoc.* 34:1-10.

Abstract- Seasonal abundance of mosquitoes, their viruses, and blood-feeding habits were determined at an open-faced quarry in North Branford, CT, in 2010 and 2011. This unique habitat had not previously been sampled for mosquitoes and mosquito-borne viruses. Thirty species of mosquitoes were identified from 41,719 specimens collected. *Coquillettidia perturbans, Aedes trivittatus*, and *Ae. vexans* were the most abundant species and represented 34.5%, 17.7%, and 14.8% of the totals, respectively. Jamestown Canyon virus was isolated from 6 species of mosquitoes collected from mid-June through July: *Cq. perturbans* (3 pools), *Ae. cantator* (3), *Ae. trivittatus* (2), *Ae. aurifer* (1), *Ae. excrucians* (1), and *Culex pipiens* (1). West Nile virus was cultured from 8 pools of *Cx. pipiens* and from 1 pool of *Culiseta melanura* collected from mid-August through late September. Cache Valley virus was isolated from 4 species of mosquitoes in 3 genera from about mid-August through late September 2011: *Cq. perturbans* (5 pools), *Ae. trivittatus* (2), *Anopheles punctipennis* (1), and *An. quadrimaculatus* (1). Nine different mammalian hosts were identified as sources of blood for 13 species of mosquitoes. White-tailed deer, *Odocoileus virginianus*, were the most common mammalian hosts (90.8%), followed by raccoon, *Procyon lotor* (3.1%), coyote, *Canis latrans* (2.4%), and human, *Homo sapiens* (1.2%). Exclusive mammalian blood-feeding mosquitoes included: *Ae. canadensis, Ae. cantator, Ae. excrucians, Ae. japonicus, Ae. vexans, An. punctipennis*, and *Cx. salinarius*. Fourteen species of birds, mostly Passeriformes, were identified as sources of blood from 6 mosquito species. Five species that fed on mammals (*Ae. thibaulti, Ae. trivittatus, Ae. cinereus, Cq. perturbans*, and *Cx. pipiens*) also fed on birds.

Berenbaum, M.R., Gray, S.M., Groves, R.L., Scorza, R., **Triplett, L.R.,** Trumble, J., Yang, B., and Fletcher, J. A review of the citrus greening research and development efforts supported by the Citrus Research and Development Foundation: Fighting a ravaging disease. National Academies of Sciences, Engineering, and Medicine. Washington, DC: the National Academies Press. doi: https://doi.org/10.17226/25026.

Abstract-Citrus greening disease poses a serious danger to the U.S. citrus industry. Associated with a bacteria that is spread by the Asian citrus psyllid, the infection results in blotchy mottling of leaves, stunting of shoots, gradual death of branches, and small, deformed fruits with bitter juice. Citrus greening disease cost Florida a cumulative loss of $2.9 billion in grower revenues from 2007 to 2014. The Citrus Research and Development Foundation (CRDF) is a $124 million state citrus-industry initiative that has invested nearly 90 percent of its funds in research to combat citrus greening. Conducted at CRDF's request, this National Academies of Science study reviews the foundation's research portfolio. The review finds that, although the foundation was responsive to recommendations from a previous National Academies study, citrus greening has progressed from an acute to a chronic disease throughout Florida. Significant barriers to fighting the disease persist, including the inability to culture the bacteria in the laboratory, the lack of advanced diagnostics for early disease detection, and the absence of standardized research methodology that would improve the comparability of re-

sults across studies. The study concludes that a single breakthrough discovery for managing citrus greening in Florida is unlikely. The report calls for a systems approach to citrus greening research prioritization and the strategic distribution of resources for research leading to effective disease management. Growers in the state will need short-term solutions for the industry to remain viable. In the long run, citrus greening solutions would likely utilize new technology, such as gene modification and gene editing, focusing on targets that mediate molecular interactions among plant, bacteria, and the vector.

Giordano, P.R., Wang, J., Vargas, J.M., Jacobs, J. Chilvers, M.I., and **Zeng, Q.** (2018) Using a genome-based PCR primer prediction pipeline to develop molecular diagnostics for the turfgrass pathogen *Acidovorax avenae*. **Plant Disease https://doi.org/10.1094/PDIS-01-18-0165-RE**

Abstract-*Acidovorax avenae* is the causal agent of bacterial etiolation and decline (BED) of creeping bentgrass, a poorly understood and often misdiagnosed disease that can result in considerable aesthetic and functional damage to golf course putting greens. Current diagnostics of BED are based on laborious culture-based methods. In this work, we employed a novel alignment-free primer prediction pipeline to design diagnostic primers for turfgrass pathogenic *A. avenae* using 15 draft genomes of closely related target and non-target *Acidovorax* as input. Twenty candidate primer sets specific to turfgrass pathogenic *A. avenae* were designed. The specificity and sensitivity of these primer sets were validated via a traditional PCR and a real-time PCR assay. Primer sets 0017 and 0019 coupled with an internal oligo probe showed optimal sensitivity and specificity when evaluated with the target pathogen, closely related bacterial species and microorganisms that inhabit the same host and soil environment. Finally, the accuracy of the newly developed real-time PCR assay was evaluated to detect BED pathogens from BED symptomatic and asymptomatic turfgrass samples. The diagnostic results produced by the real-time PCR assay were consistent with results of a cultural-based method. This assay will allow quicker and more effective detection of the BED pathogen thus potentially reducing misdiagnoses and unnecessary usage of fungicides.

Hsieh, H.S., Pignatello, J. J.*, Modified carbons for enhanced nucleophilic substitution reactions of adsorbed methyl bromide. *Applied Catalysis B: Environmental* **2018,** *233*, 281-288.

Abstract- Activated carbons are highly-effective adsorbents for the passive removal of organic pollutants from aqueous and gaseous phases. However, the pollutant remains chemically unchanged and poorly available to dissolved reagents. In this study, we developed quaternary ammonium (QA)-modified carbon adsorbent-catalysts that can catalyze direct reactions between adsorbed molecules and anionic reagents, thereby permitting a trap-and-degrade strategy. The concept was applied to base hydrolysis of methyl bromide (CH_3Br, MeBr), a quarantine and pre-shipment fumigant of concern as an ozone-depleting gas. Modifications of the carbons included irreversible adsorption of the cationic polyelectrolyte, poly (diallyldimethylammonium chloride) (PDADMAC), and covalent grafting of QA groups via precursors (Quat188 and Quab360). In mixtures of the carbon in 1 M NaOH at 55 ° C under conditions where hydrolysis in the aqueous phase was negligible, first-order rate constants were increased by up to a factor of 7.4 compared to the unmodified carbon. Combined PDADMAC/Quat188 modification was superior to the correspond-

ing individual modification. Rate acceleration was due to attraction of hydroxide ions to the newly-created anion exchange sites. This is supported by effects of QA modification on anion exchange capacity, point of zero charge, and isoelectric point, as well as by the results of competition experiments with otherwise-inert monovalent anions. The modified catalysts are robust for at least five hydrolysis cycles. QA modification also greatly enhances hydrolysis at unadjusted pH (8.6–10.2) and nucleophilic reaction by thiosulfate. QA modification of carbons is a promising approach for in situ trapping and degrading MeBr or other hydrophobic compounds that are reactive toward anionic reagents.

McGehee, C., Raudales, R.E., and **Elmer, W.H.,** 2018. First report of *Pythium dissotocum* Causing Pythium Root Rot on Hydroponically-Grown Lettuce in Connecticut. Plant Disease https://doi.org/10.1094/PDIS-02-18-0365-PDN.

Abstract -In August 2016, lettuce (*Lactuca sativa* L.) plants presented root rot, severe wilting, and high incidence of mortality in New Haven County, CT. The plants were grown in a hydroponic deep-water culture system in a commercial greenhouse. Mature plants were stunted, the lower leaves were chlorotic, the roots were necrotic, and some plants collapsed. Lettuce roots were collected from several symptomatic plants, washed three times with sterile deionized water, blotted dry, and plated on PARP-V8. The isolate was identified as *Pythium dissotocum* based on the morphology of sexual and asexual structures following van der Plaats-Niterink's key (van der Plaats-Niterink 1981) and BLAST nucleotide analyses from ITS sequences. Koch's postulates, were satisfied on 14-day old lettuce seedlings. This is the first report of *P. dissotocum* being detected on lettuce in Connecticut. *Pythium dissotocum* reduces crop yield and was first reported in 1986 as a root pathogen on hydroponic lettuce in Arizona (Stanghellini and Kronland 1986). There are currently no registered synthetic-chemical fungicides in the US for the suppression of *Pythium* species in hydroponic lettuce (Utkhede et al. 2009). Prevention of this disease is recommended by controlling temperature and salt levels in the nutrient solution, sanitizing surfaces, and applying preventative biological fungicides registered for Pythium root rot.

Tan, Y., Tsan-Yuk Lam T, Heberlein-Larson, L.A., Smole, S.C., Auguste, A.J., Hennigan, S., Halpin, R.A., Fedorova, N., Puri, V., Stockwell, T.B., Shilts, M.H., Andreadis, T., **Armstrong, P.M.**, Tesh, R.B., Weaver, S.C., Unnasch, T.R., Ciota, A.T., Kramer, L.D., Das, S.R. Large scale complete genome sequencing and phylodynamic analysis of eastern equine encephalitis virus reveal source-sink transmission dynamics in the United States. J Virol. 2018 Apr 4. pii: JVI.00074-18.

Abstract- Eastern equine encephalitis virus (EEEV) has a high case-fatality rate in horses and humans, and Florida has been hypothesized to be the source of EEEV epidemics for the northeastern U.S. To test this hypothesis, we sequenced complete genomes of 433 EEEV strains collected within the U.S. from 1934 to 2014. Phylogenetic analysis suggested EEEV evolves relatively slowly and that transmission is enzootic in Florida, characterized by higher genetic diversity and long-term local persistence. In contrast, EEEV in New York and Massachusetts were characterized by lower genetic diversity, multiple introductions, and shorter local persistence. Our phylogeographic analysis supported a source-sink model in which Florida is the major source of EEEV compared to the other localities sampled. In sum, this study revealed the complex epidemiological dynamics of EEEV in different geographic regions in the

U.S., and provided general insights into the evolution and transmission of other avian mosquito-borne viruses in this region. IMPORTANCE Eastern equine encephalitis virus (EEEV) infections are severe in horses and humans on the east coast of the United States with over 90% mortality rate in horses, approximately 33% mortality rate in humans, and significant brain damage in most human survivors. However, little is known about the evolutionary characteristics of EEEV due to the lack of genome sequences. By generating large collection of publicly-available complete genome sequences, this study comprehensively determined the evolution of the virus, described the epidemiological dynamics of EEEV in different states in the U.S., and identified Florida as one of the major sources. These results may have important implications for the control and prevention of other mosquito-borne viruses in the Americas.

Ward, J.S., and **Williams, S.C.** 2018. Effect of tree diameter, canopy position, age, and browsing on stump sprouting in southern New England. Forest Science. 64(x): 9p. doi:10.1093/forsci/fxx023

Abstract- Stump sprouts can be an important component of regeneration, especially for sprout dependent species (e.g., oak) where there is inadequate advanced regeneration. On nine recently harvested areas in southern New England, we examined the influence of preharvest tree diameter and canopy position on the probability of thirteen species developing at least one stump sprout after harvesting. Stump sprouting decreased with preharvest diameter for upland oaks, red maple, sugar maple, and black birch. At typical merchantable diameters, harvested red maples were twice as likely to sprout as upland oaks. On four new clearcuts, we examined the influence of browsing on 4-year growth of oak stump sprouts. Browsing reduced total height growth of oak sprouts by 1.5 m relative to sprouts in cages, but did not prevent sprouts from growing tall enough to be above the browse line. However, the reduction in height growth of oak stump sprouts was sufficient to reduce the proportion of stumps with at least one free-to-grow sprout from 84% of stumps protected from deer to only 44% of unprotected sprouts. Delaying harvest of oaks that have exceeded minimum merchantable diameters will reduce the number of free-to-grow sprouts in new stands, especially if browse damage can be expected.

William R. L. Anderegg, W.R.L., Wolf, A., **Arango-Velez, A.**, and others. 2018. Woody plants optimise stomatal behaviour relative to hydraulic risk. Ecology Letters. doi: 10.1111/ele.12962

Abstract- Stomatal response to environmental conditions forms the backbone of all ecosystem and carbon cycle models, but is largely based on empirical relationships. Evolutionary theories of stomatal behaviour are critical for guarding against prediction errors of empirical models under future climates. Longstanding theory holds that stomata maximise fitness by acting to maintain constant marginal water use efficiency over a given time horizon, but a recent evolutionary theory proposes that stomata instead maximise carbon gain minus carbon costs/risk of hydraulic damage. Using data from 34 species that span global forest biomes, we find that the recent carbon-maximisation optimisation theory is widely supported, revealing that the evolution of stomatal regulation has not been primarily driven by attainment of constant marginal water use efficiency. Optimal control of stomata to manage hydraulic risk is likely to have significant consequences for ecosystem fluxes during drought, which is critical given projected intensification of the global hydrological

cycle.

Yang, Y., Banerjee, G., Brudvig, G. W., Kim, J.H., **Pignatello, J. J.*,** Oxidation of Organic Compounds in Water by Unactivated Peroxymonosulfate. *Environ. Sci. Technol*. **2018**.

Abstract- Peroxymonosulfate (HSO_5^- and PMS) is an optional bulk oxidant in advanced oxidation processes (AOPs) for treating wastewaters. Normally, PMS is activated by the input of energy or reducing agent to generate sulfate or hydroxyl radicals or both. This study shows that PMS without explicit activation undergoes direct reaction with a variety of compounds, including antibiotics, pharmaceuticals, phenolics, and commonly used singlet-oxygen ($^1O_2$) traps and quenchers, specifically furfuryl alcohol (FFA), azide, and histidine. Reaction time frames varied from minutes to a few hours at pH 9. With the use of a test compound with intermediate reactivity (FFA), electron paramagnetic resonance (EPR) and scavenging experiments ruled out sulfate and hydroxyl radicals. Although $^1O_2$ was detected by EPR and is produced stoichiometrically through PMS self-decomposition, $^1O_2$ plays only a minor role due to its efficient quenching by water, as confirmed by experiments manipulating the $^1O_2$ formation rate (addition of H_2O_2) or lifetime (deuterium solvent isotope effect). Direct reactions with PMS are highly pH- and ionic-strength-sensitive and can be accelerated by (bi)carbonate, borate, and pyrophosphate (although not phosphate) via non-radical pathways. The findings indicate that direct reaction with PMS may steer degradation pathways and must be considered in AOPs and other applications. They also signal caution to researchers when choosing buffers as well as $^1O_2$ traps and quenchers.

JOURNAL ARTICLES APPROVED APRIL 2018

Borgatta, J., **Chuanxin Ma**, N. Hudson-Smith, **Wade Elmer**, C. D. Plaza Pére, **Roberto De La Torre-Roche**, **Nubia Zuverza-Mena**, C. L. Haynes, **Jason C. White**, and R. J. Hamers. Copper nanomaterials suppress root fungal disease in watermelon (*Citrullus lanatus*): role of particle morphology, composition and dissolution behavior. *ACS Sustainable Chemistry and Engineering*

Bugbee, Gregory J. and **Summer E. Stebbins**. Monitoring Report: Invasive aquatic plants – Candlewood Lake, Squantz Pond, Lake Lillinonah, Lake Zoar 2017. *Station Bulletin* (Web only)

Bugbee, Gregory J. and **Abigail C. Wiegand**. Monitoring Report: Invasive aquatic plants – Lake Housatonic 2017. *Station Bulletin* (Web only)

Bugbee, Gregory J., **Summer E. Stebbins**, and **Abigail C. Wiegand**. Taunton Lake, Newtown, CT – Aquatic vegetation survey, water chemistry, aquatic plant management options. *Station Bulletin* (Web only)

De La Torre-Roche, Roberto, L. Pagano, S. Majumdar, **Brian D. Eitzer**, **Nubia Zuverza-Mena**, **Chuanxin Ma**, A. Servin, N. Marmiroli, O. Parkash Dhankher, and **Jason C. White**. Co-exposure of imidacloprid and nanoparticle Ag or CEO_2 to *Cucurbita pepo* (Zucchini): contaminant bioaccumulation and translocation. *NanoImpact*

Gent, Martin P.N. Modeling translocation and metabolism in plants. *Acta Horticulturae*

Guo, H., **Chuanxin Ma**, L. Thistle, M. Huynh, C. Yu, D. Clasby, B. Chefetz, T. Polubesova, **Jason C. White**, L. He, and B. Xing. Phototransformation of Ag ions to Ag nanoparticle-loaded AgCl microcubes in the rhizosphere. *Environmental Science & Technology*

Ma, Chuanxin, X. Cao, W. Ma, H. Guo, Y. Tang, R. Huang, O. Parkash Dhankher, X. Zhang, S. Zhang, Q. Zhao, **Jason C. White**, and B. Xing. Phytotoxicity of layered black phosphorus to *Arabidopsis thaliana* (L.): physiological and molecular response. *ACS Nano*

Pagano, L., E. Maestri, M. Caldara, **Jason C. White**, N. Marmiroli, and M. Marmiroli. ENM activity at the organelle level: impacts on the chloroplast and mitochondria. *ACS Sustainable Chemistry & Engineering*

Soghigian, John, **Theodore G. Andreadis**, and **Goudarz Molaei**. Population genomics of *Culiseta melanura*, the principal vector of Eastern equine encephalitis virus, in the United States. *PLOS Neglected Tropical Diseases*

Xiao, F., B. Gámiz, and **Joseph J. Pignatello**. Adsorption and desorption of nitrous oxide on raw and thermally air-oxidized chars. *Journal of Agricultural and Food Chemistry*

GRANTS RECEIVED APRIL 2018

DR. RICHARD COWLES wrote the proposal to the "Feed a Bee" initiative, which was funded $2,500 to establish bee forage at Lockwood Farm.

ARTICLES OF INTEREST

DR. SCOTT WILLIAMS was awarded the John Pearce Memorial Award, which is made by the Northeast Section of The Wildlife Society to Society members in the Northeast for outstanding professional accomplishments in wildlife conservation through contribution of knowledge and leadership over a period of several years in any area of wildlife work, including research, management, administration, or education – as evidence by publications, skillful development, and/or application of effective management or educational programs or methods (4/16/18).

Outgoing Northeast Section President Emily Just presents President-Elect **DR. WILLIAMS** with the John Pearce Memorial Award in front of an audience of 300 of their peers.

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Volume 8 Issue 5
May 2018

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