Station News

The Connecticut Agricultural Experiment Station
Volume 6 Issue 7 July 2016

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

ADMINISTRATION

DR. THEODORE ANDREADIS was interviewed about federal and state funding for research and surveillance for Zika virus by Kyle Arnold Waterbury Republican American (June 14); presented an update on Experiment Station activities at a meeting of the Experiment Station Associates Board of Directors held at Lockwood Farm, Hamden (June 22); and presented welcoming remarks and an overview of the Experiment Station and its various research, regulatory and public service programs to a group of students from Central Connecticut State University (15 attendees) (June 23).

ANALYTICAL CHEMISTRY

DR. JASON C. WHITE met with Ms. Jan Spiegel of the CT Mirror regarding a new USDA-funded research project on using nanotechnology to suppress crop disease (June 1, 3 and 10); attended the USDA Nanotechnology for Agricultural Systems Project Director Program review at Pennsylvania State University in State College and presented a posted entitled "Nanoscale nutrients suppress plant disease, increase macronutrient use efficiency, and increase yield" (50 attendees) (June 5-7); participated in a USDA AFRPS webinar on project deliverables and year two funding requests (June 8); along with **DR. CHRISTINA ROBB, MR. MICHAEL CAVADINI, MR. JOSEPH HAWTHORNE, MR. CRAIG MUSANTE, AND MS. TERRI ARSENAULT** participated in the monthly FDA FERN cCAP teleconference call (June 9); spoke by phone with Ms. Jane Philbrick, a Landscape Designer, concerning a phytoremediation project in Georgetown CT (June 21); participated in a Skype call with Professor Nelson Marmiroli of the University of Parma, Italy, and his staff regarding ongoing collaborative research projects focused on the toxicity of engineered nanomaterials (June 22); met with Professor James Kearns of SCSU and discussed Department research and regulatory projects (June 22); along with **DR. SANGHAMITRA MAJUMDAR** met with **DR. QUAN ZENG** and Dr. Ravi Patel to discuss LC-MS analysis of novel antimicrobial compounds from their research (June 23); participated in a quarterly FDA FERN-wide teleconference call (June 23); chaired the quarterly CAES Safety Committee meeting (June 24); spoke by phone with Professor Leanne Gilbertson of the University of Pittsburgh on preparation of a joint USDA proposal focused on nanoscale nutrient delivery (June 24); participated in an FDA FERN cCAP Project Directors call and training session on project reporting and deliverables (June 27); and attended the "Environmental Sciences: Water" Gordon Conference in Holderness NH and gave a presentation entitled "Nanomaterials and the food supply: Assessing the balance between applications and implications" (170 attendees)(June 28-30).

DR BRIAN EITZER attended the monthly CT Preparedness meeting at the Department of Public Health Laboratory in Rocky Hill (June 6) and was a participant in the North American Chemical Residue Workshops organizing committee conference call (June 9).

DR CHRISTINA S. ROBB participated in an Eastern Analytical Symposium board meeting (June 3); performed some solar experiments with the ready-set-grow pre-school classrooms of the Creative Arts Preschool in

Woodbury (20 attendees) (June 22); and presented an overview of the work of the Department of Analytical Chemistry to students of Central Connecticut State University (CCSU) (25 attendees) (June 23).

Ms. Sadia Younas (left) and Mr. Francesco Pasquali are currently working in the Department of Analytical Chemistry on projects related to nanomaterial fate and effects. Sadia is rising senior from Southern CT State University and is completing a research internship to support her studies. Francesco is a Ph.D. student from University of Parma, Italy and is here on a 3 month fellowship.

ENTOMOLOGY

DR. KIRBY C. STAFFORD III was interviewed by Matt Scott, Fox61 News, about the gypsy moth outbreak (June 1); interviewed by Anna Bisaro, New Haven Register, about the gypsy moth outbreak (June 2); interviewed by Jacquie Slater, WTNH News 8, about the gypsy moth outbreak (June 2); interviewed by Chris Hall, NBC Connecticut News, about the gypsy moth outbreak (June 2); interviewed by Nate Lynch, New London Day, about the gypsy moth outbreak (June 2); interviewed by Gregory Hladkey, Hartford Courant, about the emerald ash borer (June 7); with DR. PHILIP ARMSTRONG, was interviewed by Sam Gingerella, WTIC-Radio, about the upcoming season for mosquitoes and ticks (June 8); presented a talk on tick management at the New London County Agricultural Extension Council (June 9); was interviewed by Gregory Hladkey, Hartford Courant about the spread of the emerald ash borer (June 9); interviewed by Patrick Skahill, WNPR, Connecticut Public Radio, about the gypsy moth (June 9); presented a talk on ticks at the New London County Extension Council annual meeting in Norwich, CT (32 attendees) (June 9); participated in an USDA table-top Incident Command System exercise in Jones Auditorium (14 participants) (June 14); spoke about tick-borne diseases at the EPA Region 1 headquarters in Boston, MA (60 attendees plus 20 on conference connection) (June 15); interviewed by Matt Scott, Fox61 News, about the southern pine beetle and spruce trees (June 16); interviewed by Andrew Revkin, New York Times, about the gypsy moth fungus (June 20); spoke about tick-borne and mosquito-vectored diseases in Westport, CT (20 attendees) (June 20); spoke to students about Entomology programs to students on a tour from Central Connecticut State University (June 23); was quoted by the New Haven Register on the role of moving firewood in introducing new forest pests (June 24); spoke about tick-borne diseases and tick management at Northwest Park Nature Center in Windsor, CT (50 attendees) (June 25); interviewed by Sue Haigh, Associated Press, about the gypsy moth (June 27) (resulted in front page article in New Haven Register and appearing in other newspapers); interviewed by Mary Jo DiLonardo, Mother Nature Network about the gypsy moth (June 29); interviewed by Morgan Heinz, Hartford Courant, about the gypsy moth (June 30) (resulted in front page story on June 1st); and interviewed by Hallie Metzger for the TIMPRO Connecticut Newsletter, about the gypsy moth outbreak (June 30).

MR. MARK H. CREIGHTON set up a Bee Health table at the Connecticut Beekeepers Association's 125 year celebration at Lockwood Farm, New Haven, CT (300 + attendees) (June 4), honey Bee registration forms were also collected; spoke on Honeybee Health topics at the Stonington Land Trust annual meeting at Stonington Vineyards (60 attendees) (June 13); and was presented a Life Saving Medal by the Lieutenant Governor on behalf of the Department of Public Safety for a medical event that I was involved with in 2015 (June 22).

DR. CHRIS T. MAIER participated in the University of Connecticut Bioblitz in Hartford Co. where a new national record for recorded species was established (June 3 -4) and spoke about the threat of the spotted lanternfly, an exotic insect, while attending a twilight meeting of the Connecticut Pomological Society at Belltown Hill Orchard, Glastonbury (June 15).

DR. GALE E. RIDGE was interviewed by Nora Norton from the Stamford Advocate about the a recent breakthrough for treating tick borne Babesiosis (June 6); identi-

fied both virus (*Nuclear polyhedrosis*) and fungus (*Entomophaga maimaiga*) in dead Gypsy moth caterpillars (*Lymantria dispar*) submitted by Bob Standish of Hadlyme CT (June 13); identified the Brown House Moth, *Hofmannophila psedospretella* from a home in Plantsville, CT (June 13); interviewed by Angela Fritz from the Washington Post about the Gypsy moth outbreak in Connecticut (June 28); and interviewed by Anna Costera from the New Haven register about the Gypsy moth outbreak (June 30).

DR. CLAIRE E. RUTLEDGE was interviewed by Brigitte Ruthman, Waterbury Republican American, and met with their photographer at White Memorial Conservation Center in Litchfield (June 2) (resulted in the article 'Wasps ready to strike a blow at the ash borer: State steps up use of insect to combat devastating beetle' June 6th); was interviewed by a reporter from WSFB, Channel 3 News, to explain biological control of Emerald Ash Borer (June 6); was interviewed by WTNH Channel 8 News to explain biological control of Emerald Ash Borer (June 8); helped administer the oral exam portion of the Arborists Licensing Exam (June 9); gave a talk on 'Emerald Ash Borer in Connecticut' to the North End Club in New Haven, CT (50 adults) (June 10); and conducted a training for Wasp Watchers, a citizen-scientist group that uses biosurveillance to detect and monitor emerald ash borers, at White Memorial Conservation Center, Litchfield, CT (15 adults) (June 29).

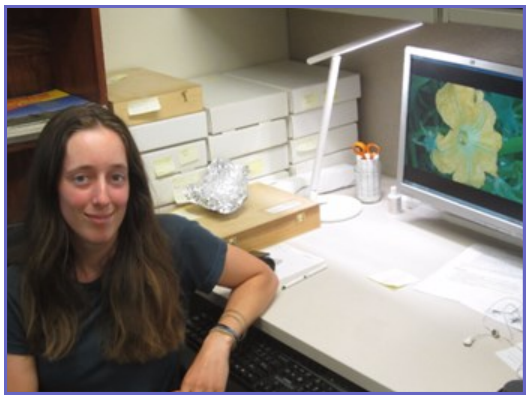
DR. VICTORIA L. SMITH participated in a table-top exercise of the Incident Command System, held in Jones Auditorium (14 participants) (June 14).

DR. KIMBERLY A. STONER presented "The Buzz on Bees" at the invitation of the Agricultural Commission of East Windsor and the Connecticut Farm Bureau at Scout Hall, East Windsor (65 attendees) (June 14); and presented a talk on bumble bees as part of the Bumble Bee Jamboree at the Bellamy-Ferriday Garden in Bethlehem. (23 attendees, 7 under the age of 18) (June 25).

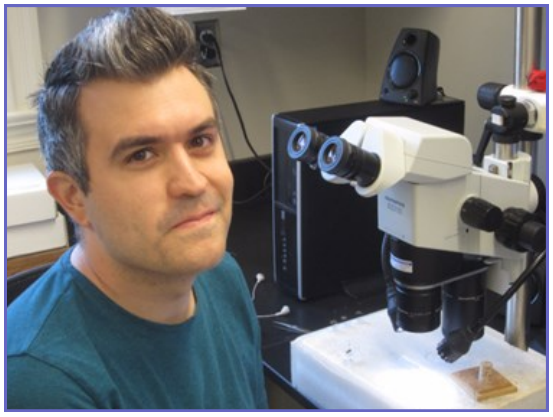
SEASONAL RESOURCE ASSSITANTS AND INTERNS: The Department of Entomology has seven seasonal resource assistants, three of which have worked here previously, and three interns that are working with the scientists and technicians over the summer and fall of 2016.

IONELLA MIOARA SCOTT graduated from Universitatea de Stiinte Agricole si Medicina Venterinira in Cluj, Romana with a 5 year degree in Agricultural Engineering. She has worked as a seasonal worker each summer at CAES since 2008. Over the years Mioara has worked on many projects including the Connecticut portion of a national survey for the Emerald Ash Borer (an invasive beetle that attacks ash trees), a study of *Cerceris fumipennis* (a native wasp that uses the beetles as food), behavioral studies of beetle mating and fecundity, field trapping studies on the pheromones of Cerambycidae and the field work that followed the discovery of Southern Pine Beetle in Connecticut last summer. Mioara made the first discovery of the emerald ash borer in Prospect, CT in 2012.

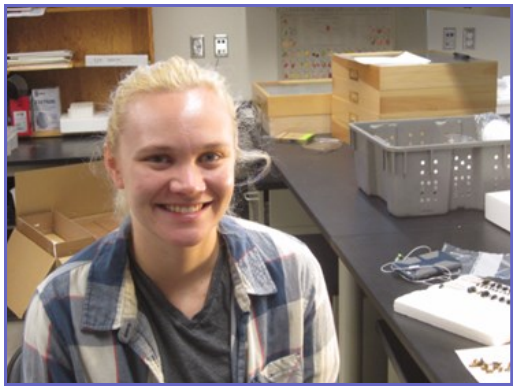
ZACHARY BROWN got an entomological and wildlife start working with the White Memorial Conservation Center in Litchfield on emerald ash borer surveillance along with some invasive plant and earthworm surveys. He joined CAES in 2015 to assist with the Cooperative Agricultural Pest Survey (CAPS) and Forest Pest Survey and Outreach Project. He obtained his Bachelor's degree from the University of Connecticut in 2014 in Natural Resources and the Environment with a concentration in climate and water resources.



OLIVIA ZUKAS is a graduate of Sterling College in Vermont with a Bachelor's degree in Conservation Ecology. She has worked on mapping southern pine beetle infestations on Long Island and is currently working with DR. KIMBERLY STONER on the pollinator program. Her other recent jobs were mapping and managing invasive plants on Long Island and assessing natural communities and rare and invasive plants for the Maine Natural Areas program.



This is **BENJAMIN GLUCK**'S fourth summer working with Dr. KIMBERLY STONER, participating in studies of floral resources on vegetable farms, pumpkin and winter squash pollination, exposure of bees to pesticides in ornamental horticulture, and long term bee diversity monitoring. He has a bachelor's degree in Ecology and Evolutionary Biology from the University of Connecticut (2010) and brings a lot of experience working with native bees to the projects. In 2013, he also worked for the University of California at Davis, sampling bees and developing wildflower seed mixes for year-round floral resources for bees in agricultural settings.

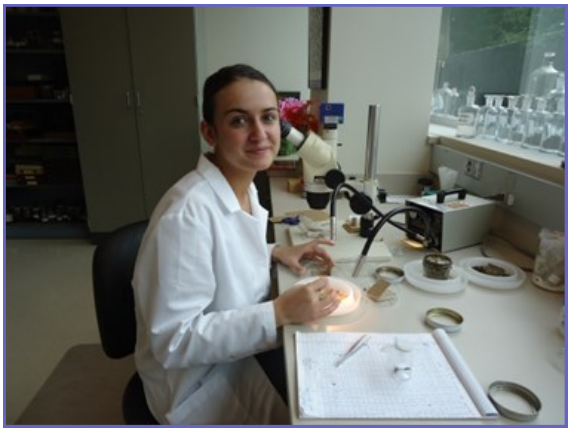


ALISON HANSEN graduated from Quinnipiac University in May 2016 with a B.S. in Biology and a number of academic honors. Not a stranger to extreme outdoor conditions, Alison has worked in Joshua Tree National Park on a California Phenology Project monitoring phenophases of desert plant species. She is working with DR. KIMBERLY STONER on the pollinator program.

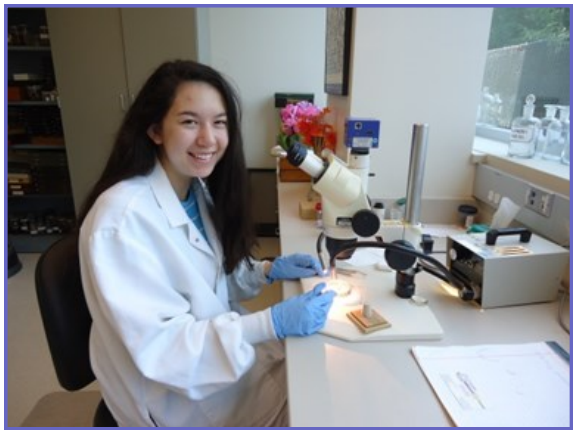
MEGAN CARROLL is working towards her Bachelor's degree in Wildlife and Fisheries Management at Unity College in Maine. She has worked with DEEP in goose banding and collecting data on purple martins, and has a variety of fisheries experience.

ERICA RAYACK is a recent graduate of Mount Holyoke College with a Bachelor of Arts in Biological Sciences. She worked with Professor Michael Singer at Wesleyan University on a caterpillar parasitoid and maintained caterpillar, wasp, and fly colonies. With an interest in public health, Erica studied in Costa Rica on a tropical medicine program.

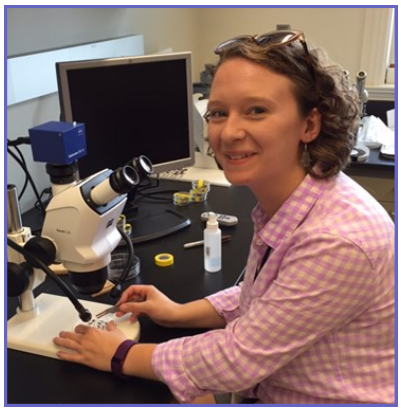
Both MEGAN CARROLL and ERICA RAYACK assist DR. KIRBY STAFFORD, DR. SCOTT WILLIAMS, and HEIDI STUBER with the integrated tick management projects.



Working with DR. GALE RIDGE ; **EVA MUCA** who is studying Bio-pre-med at Southern Connecticut State University. She will be graduating May 2017.



Working with DR. GALE RIDGE; **SARAH SAXE** will be entering her senior year at Amity Senior High School this September. She is planning to take a liberal arts degree at a New England college with a major in science.



SHELBY FARNHAM is a Junior at SUNY ESF in Syracuse NY where she is an Environmental Science major. Shelby is working with DR. CLAIRE RUTLEDGE on the Wasp Watcher program as well as assisting in the biological control releases for Emerald Ash Borer.

ENVIRONMENTAL SCIENCES

DR. JOSEPH PIGNATELLO gave an invited talk, "Nanoscale Interactions between Engineered Nanomaterials and Black Carbon (Biochar) in Soil," at the USDA Nanotechnology Grantees Annual Meeting, Penn State University (approx. 150 attendees) (June 6-7); and his paper "Activation of Hydrogen Peroxide and Solid Peroxide Reagents by Phosphate Ion in Alkaline Solution" in *Environmental Engineering Science,* 33(3), 193-199 (2016), was chosen as "Editor's Spotlight".

DR. PHILIP ARMSTRONG was interviewed by CT Radio Network about mosquito-borne diseases in Connecticut (June 1); was interviewed by News Channel 8 and Channel 3 about the start of the mosquito trapping program and threats posed by Zika virus (June 1); was interviewed by the Republican American about the mosquito monitoring program (June 2); was interviewed by the New Haven Register about the mosquito monitoring program (June 7); and was interviewed by WTIC about mosquitoes and their diseases in Connecticut (June 8).

MS. ANGELA BRANSFIELD participated in the Association of Public Health Laboratories (APHL) Webinar, "Shipping Select Agents, Toxins and Other Infectious Materials" (June 1); participated in the Sandia National Laboratories forum "Biological Select Agents and Toxins: Risk Assessment and the Regulated Community" (June 13); and attended The CT Biosafety Alliance Group meeting at Wesleyan University in Middletown, CT (June 17).

MR. GREGORY BUGBEE spoke at a meeting of the Friends of lake Quonnipaug CAES IAPP surveys and control options for invasive aquatic plant problems North Guilford Firehouse (approximately 30 attendees) (June 2); with Jennifer Fanzutti, spoke at a meeting of the Friends of Lake Lillinonah on CAES IAPP surveys and control options for invasive aquatic plant problems at the Bridgewater Town Office Building (June 17) (approx. 30 attendees); and spoke to a class from Central Connecticut State University on Soil Testing and Invasive Aquatic Plants (June 23) (approx. 25 attendees).

DR. GOUDARZ MOLAEI hosted students from Central Connecticut State University, Molecular Biology Laboratory and presented a short talk on his research on the role of mosquitoes and ticks in disease transmission, and on the services provided by the CAES Tick Testing Laboratory (approx. 17 attendees) (June23).

MR. MICHAEL THOMAS participated in Connecticut State BioBlitz held at Two Rivers Magnet School in East Hartford (June 3-4).

DR. BLAIRE STEVEN was acknowledged for authorship of one of the most highly cited articles in 2015 in the journal *FEMS Microbiology Ecology*: "Dryland soil microbial communities display spatial biogeographic patterns associated with soil depth and soil parent material" published in 2013.

Summer Research Assistants in the Department of Environmental Sciences for 2016

First row (left to right):

Max Engel - Mosquito Surveillance Program (University of Connecticut)

Robin Pancoast - Mosquito Surveillance Program (University of Connecticut)

Sofia Moscovitz - Mosquito Surveillance Program (Oberlin College)

Thomas Ferri - Tick Testing (Southern Connecticut State University)

Magali Buzzano - Tick Testing (University of New Haven)

Second row (left to right):

James Maccone - Mosquito Surveillance Program (University of Connecticut)

Aneta Strumilowska - Mosquito Surveillance Program (George Washington University)

Cora Ottaviani - Mosquito Surveillance Program (University of Hartford)

Summer Stebbins - Invasive Aquatic Plant Program (Boston College)

Jianxun Shen - Tick Testing (University of New Haven)

Daniel Cole - Mosquito Surveillance Program (University of Connecticut)

Back row (left to right)

Charles Sisson - Tick Testing (University of New Haven)

Ryan Gregory - Mosquito Surveillance Program (Central CT State University)

Carlos Franco - Mosquito Surveillance Program (Wesleyan University)

Michael Olson - Mosquito Surveillance Program (Tulane University)

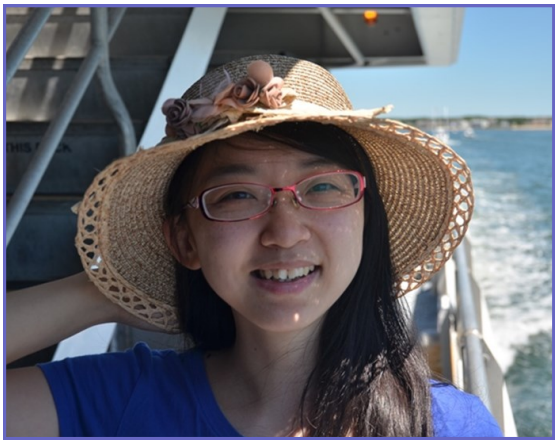
Alex Diaz - Virus Testing (Quinnipiac University)

Not Pictured

Sarah Abusaa- Mosquito Surveillance Program (Yale University)

Stephanie Canales - Mosquito Surveillance Program (Central CT State University)

Dr. John Soghigian is a postdoctoral research scientist in Dr. Goudarz Molaei's laboratory where he is conducting research on population genetics of mosquito vectors of human diseases. John's primary research interests are in population biology, and specifically on evolutionary and ecological interactions among vectors, hosts, and pathogens. John completed his doctorate in May of 2016 with Dr. Todd Livdahl at Clark University, where his dissertation focused on the ecology and evolution of container dwelling mosquito communities and their *Ascogregarina* parasites. John was awarded a National Science Foundation Dissertation Improvement Grant for his work on the evolution of *Ascogregarina* in *Aedes* mosquito hosts, and received a Jobbins Scholarship from the Northeastern Mosquito Control Association for his work on a molecular phylogeny of mosquitoes. As a postdoctoral scientist, John is conducting research on population genetics of *Culiseta melanura*, the principal vector of eastern equine encephalitis virus in the northeastern US. By assessing population structure of this important mosquito vector, John hopes to better understand the ecoepidemiology of the virus, explore the role that this mosquito species plays in transmission in different virus foci, and identify potential gene-by-environment interactions that could inform human and equine disease risk.



Dr. Yi Yang joined the Department of Environmental Sciences as a Research Associate in Dr. Joseph Pignatello's group in July. She is working on a project investigating activation of peroxide reagents by phosphate ion for the degradation of organic pollutants. Yi received her Ph.D. degree from the School of Municipal and Environmental Engineering at Harbin Institute of Technology (China) in October, 2015. This is her second visit here. As a graduate student, she worked as a visiting scholar in Dr. Pignatello's group for about a year starting September 1, 2013 on a collaborative project with Prof. Bill Mitch, then at Yale, and her PhD thesis advisor. She can be found on the third floor of Slate.

FORESTRY AND HORTICULTURE

DR. JEFFREY WARD administered practical and oral examination to arborist candidates for the Connecticut Tree Protection Examining Board (June 8); spoke Japanese barberry control and relationship to tick densities at the Lyme disease: Restoring balance in the body workshop in Tolland (33 attendees) (June 11); was appointed Vice-Chair of the New England Society of American Foresters in Concord, NH (June 15); gave invited lecture "Fire and silvicultural tools for securing oak regeneration" at North Atlantic Fire Science Exchange workshop "Fire in oak: regional differences, local applicability" in Westborough, MA (51 attendees) (June 16); was interviewed about impact of gypsy moth defoliation on forests by Aaron Kupek, WTIC 1080 radio (June 25); and meet with CT DEEP and Regional Water Authority foresters to provide summary of recent research and discuss oak regeneration (10 attendees) (June 28).

DR. ADRIANA ARANGO VELEZ met with Leslie Kane (Audubon Connecticut) to discuss white pine decline at the Bent-of-the-River Sanctuary in Southbury (June 13); and began collaborating on a USDA multistate project to examine white pine health and responses to environmental and climate changes (June 16).

DR. MARTIN P.N. GENT attended the NE1335 regional research committee meeting in Riverhead NY and reported on a trial of Poinsettia infected with Pythium and treated when silicon and/or partial saturation ebb and flow watering (June 22-24).

DR. ABIGAIL MAYNARD talked about the New Crops Program at the DeFranesces Farm in Northford (June 15); talked about the New Crops Program with Stephanie Page in North Branford (June 15); and spoke about the New Crops Program with 4 farmers at the Hamden Farmers Market (June 24).

PLANT PATHOLOGY AND ECOLOGY

DR. WADE ELMER attended the Bioblitz event in East Hartford (June 3), was interviewed by Ms. Jan Ellen Spiegel of *CT Mirror* about the role of nanoparticles in agriculture (June 9).

DR. YONGHAO LI presented the talk about 'Spruce Needle Casts and Their Control' at the CCTGA twilight meeting in Woodstock Valley, CT (32 attendees) (June 21); and talked about the Plant Disease Information Office to CCSU Station Tour in New Haven, CT (20 attendees) (June 23).

Dr. ROBERT MARRA participated in an executive committee conference call for the Northeast Division of the American Phytopathological Society to discuss the October annual meeting in Ithaca, NY (June 1), visited Smith College, in Northampton, MA, to analyze elm trees using sonic and electrical-resistance tomography (June 2), participated in a Boxwood Blight Working Group conference call (June 21), participated in a webinar on the iTrees modules "Storm" and "Species" (June 23); and visited the town of Sharon, CT, to analyze elm trees on the town Green, using sonic and electrical-resistance tomography (June 27).

MS. LINDSAY PATRICK attended the Bioblitz event in East Hartford (June 3) and staffed a CAES/Plant Disease Information table during the public portion of this event (June 4); and along with DR. YONGHAO LI gave a tour of the PDIO to Central Connecticut State University biology students (20 participants) (June 23rd).

Dr. QUAN ZENG visited the Department of Plant, Soil, and Microbial Sciences at Michigan State University and met with Dr. George W. Sundin, Dr. Ching-Hong Yang and Dr. Chris Waters to discuss disease management efficacy of the T3SS inhibitors in fire blight management (June 1-3); and presented the invited seminar "Exploration on developing novel management strategies of bacterial plant diseases: from antimicrobials to flower microbiome," (35 adult attendees) (June 3).

VALLEY LABORATORY

Summer Research Assistants at the Valley Laboratory in Windsor for 2016

Left to right: **Ethan Paine**, **Emmett Varricchio**, **Katherine Diehl**, **Elizabeth Clark**, **Katelyn Whitburn**, and **Jason Flynn**. Ethan graduated from the University of Connecticut in December 2015 with a BS in Ecology and Evolutionary Biology; Emmett earned a BS in Biology from Central Connecticut State University in 2014; Katherine is a Senior at Central Connecticut State University studying Biodiversity, Ecology and Evolutionary Biology; Elizabeth is a Master's student at the University of Connecticut in Biodiversity and Conservation Biology; Katelyn is a 2016 graduate of the University of Hartford with a BS in Biology; and Jason is a teacher and coach at East Windsor High School with a Master's Degree in Education from Springfield College.

DR. JATINDER S AULAKH participated in a Christmas tree growers twilight meeting and talked about how to improve efficacy of pre-emergence herbicides for weed control and discussed emerging weed issues in Christmas tree plantations (June 21); and attended the CIPWIG symposium planning committee meeting at Windsor (June 23).

DR. CAROLE CHEAH was interviewed by Robert Miller for the Danbury News Times on the effect of the February 2016 cold snap on HWA winter mortality (April 12); gave a presentation on predicting hemlock woolly adelgid winter mortality in Connecticut at the 2016 Northeast Natural History Conference at Springfield, MA (April 23, 50 people); gave members of the Carolina Land Conservancy, NC and Tree-Savers, PA, a tour of the Kenneth White Insectary, Valley Laboratory and farm, (April 23); and with Donna Ellis (UConn) and Emmett Varricchio (CAES summer assistant), released mile-a-minute herbivorous weevils, *Rhinoncomimus latipes*, in Groton June 29, and Milford, June 30, as part of the 2016 biological control program for invasive mile-a-minute weed, funded by USDA APHIS.

DR. RICHARD COWLES met with leaders of the Connecticut Environment Council to discuss neonicotinoid legislation in Connecticut, Windsor, (4 attendees) (June 15); shared observations on "Insect and mite management" at a summer Christmas tree growers' twilight meeting, Woodstock, (40 attendees) (June 21); and was a special guest speaker for the New Hampshire/Vermont Christmas Tree Growers' association meeting, Cuttingsville, VT, (45 attendees) (June 25).

DR. JAMES LAMONDIA was interviewed about chemical injury to tobacco plants and similar symptoms from disease by Julia Ellis of Tobacco Farm Quarterly (June 15); and spoke about hop pest management research as part of the Connecticut Hop Growers Association (CHGA) Workshop and Seminar held at the Valley Laboratory (65 attendees) (June 23).

DR. DEWEI LI, with **Dr. Wade Elmer** and **Ms. Lindsay A. Patrick** participated in the 2016 CT State Bioblitz held on June 3-4 at Two Rivers Magnet School in East Hartford collecting plant pathogens and microfungi. Forty nine fungi (8 Ascomycota, 9 Basidiomycota, 30 anamorphic fungi, 2 Prostista) and one bacterium were collected and identified.

DR. KATJA MAURER spoke about growing hops in Connecticut as part of the Connecticut Hop Growers Association (CHGA) Workshop and Seminar held at the Valley Laboratory (65 attendees) (June 23).

HOPS RESEARCH MEETING HELD AT THE VALLEY LABORATORY

Sixty-five people attended the Connecticut Hop Growers Association first grower meeting held at the CT Agricultural Experiment Station Valley Laboratory on June 23, 2016. CHGA President Alex DeFrancesco welcomed growers and spoke about current status of hops and malting barley. Dr. Jim LaMondia and Dr. Katja Maurer spoke about hop culture and pest management research, Steve Schmidt of New York spoke about hop yard construction and Jaime smith of the CT Department of Agriculture spoke about farm grants for new and current farmers. Dr. Jim LaMondia and Dr. Katja Maurer toured hop and barley field plots and presented production data and management strategies. HopsHarvester of Honeoye Falls NY conducted a demonstration of a PTO-driven hops combine.

DEPARTMENTAL RESEARCH UPDATES JUNE 2016

Pagano, L.; Servin, A.D.; **De La Torre-Roche, R.**; Mukherjee, A.; **Majumdar, S.**; **Hawthorne, J.**; Marmiroli, M.; Maestri, E.; Marra, R.; Parkash Dhankher, O.; Isch, S.M.; **White, J.C.**; Marmiroli, N. 2016. Molecular response of crop plants to engineered nanomaterial exposure. *Environ. Sci. Technol. 50* (13), pp 7198–7207.

Abstract- Functional toxicology has enabled the identification of genes involved in conferring tolerance and sensitivity to Engineered Nanomaterial (ENM) exposure in the model plant Arabidopsis thaliana. Several genes were found to be involved in metabolic functions, stress response, transport, protein synthesis and DNA repair. Considering those bases, analysis of physiological parameters, metal uptake (through ICP-MS quantification) and gene expression (by RT-qPCR) of A. thaliana orthologue genes were performed across different plant species of agronomic interest in order to highlight putative biomarkers of exposure and effect specifically related to ENMs. This approach led to the identification of molecular markers in Solanum lycopersicum L. and Cucurbita pepo L. (tomato and zucchini) that might not only indicate exposure to ENMs (CuO, CeO2, La2O3), but also provide mechanistic insight into the response to ENMs. Through Gene Ontology (GO) analysis the target genes were mapped in complex interatomic networks representing molecular pathways, cellular components and biological processes involved in ENM response. The transcriptional response of 38 (out of 204) candidates genes studied varied according to particle type, size and plant species. Importantly, some of the genes studied showed potential as biomarkers of ENM exposure and may be useful for exposure and risk assessment in foods and in the environment.

Zhao, J.; Cao, X.; Wang, Z.; Zhang, C.; **White, J.C.;** Xing, B. 2016. Interactions of CuO nanoparticles with the algae *Chlorella pyrenoidosa*: Adhesion, uptake, and toxicity. *Nanotox*. DOI: 10.1080/17435390.2016.1206149.

Abstract- The potential adverse effects of CuO nanoparticles (NPs) has increasingly attracted attention. Combining electron microscopic and toxicological investigations, we determined the adhesion, uptake and toxicity of CuO NPs to the eukaryotic alga Chlorella pyrenoidosa. CuO NPs were toxic to Chlorella pyrenoidosa, with a 72 h EC50 of 45.7 mg/L. Scanning electron microscopy (SEM) showed that CuO NPs were attached onto the surface of the algal cells and interacted with extracellular polymeric substances (EPS) excreted by the organisms. Transmission electron microscopy (TEM) showed that EPS layer of algae was thickened by nearly 4-fold after CuO NPs exposure, suggesting a possible protective mechanism. In spite of the thickening of the EPS layer, CuO NPs were still internalized by endocytosis and were stored in algal vacuoles. TEM and electron diffraction analysis confirmed that the internalized CuO NPs had an average size approximately 5 nm.. The toxicity investigation demonstrated that the CuO-algae attachment did not induce a shading effect but severe membrane damage was observed. ROS generation and mitochondrial depolarization were also noted upon exposure to CuO NPs . This work provides useful information on understanding the role of NPs-algae physical interactions in nanotoxicity.

Elmer, W. H., Marra R. E., Li, H, and Li, B. 2016. Incidence of *Fusarium spp.* on the invasive *Spartina alterniflora* on Chongming Island, Shanghai, China. Biological Invasions 10.1007/s10530-015-1012-2.

Fusarium palustre is an endophyte/pathogen of *Spartina alterniflora*, a saltmarsh grass native to North America that has been associated in the USA with a saltmarsh decline known as Sudden Vegetation Dieback (SVD). Since the intentional introduction of *S. alterniflora* to stabilize mud flats on Chongming Island, Shanghai, China, *S. alterniflora* has become invasive, but shows no symptoms of dieback even though *F. palustre* can be isolated from the plant. When declining *S. alterniflora* from SVD sites in the northeastern USA were assayed for *Fusarium* species, an average of 8% of tissues sampled gave rise to a species of *Fusarium* of these, 64% were *F. palustre* and 16% were *F. incarnatum*, a nonpathogenic species. To determine if low densities of *F. palustre* could explain the lack of dieback symptoms on *S. alterniflora* from Chongming Island, we assessed the incidence and distribution of *Fusarium* spp. on *S. alterniflora* from 12 sites on Chongming Island. On average, 26% of the stem and root tissues sampled were colonized by a *Fusarium* species. Of 196 isolates recovered from *S. alterniflora*, 44% were *F. incarnatum* and 41% were *F. palustre*. Species determinations were confirmed for a subset of these isolates using a phylogenetic analysis of partial sequences of the translation elongation factor (*tef*) gene. The observation that *Fusarium* incidence on *S. alterniflora* was much greater on Chongming Island than in the USA survey raises the question as to why *S. alterniflora* on Chongming Island is showing no dieback. Other factors, such as predator release, enhanced nutritional, edaphic and /or other unidentified environmental constraints on Chongming Island may afford *S. alterniflora* protection from dieback.

Yonghao Li, 2016. Black Spot of Rose. CAES Fact Sheet. http://www.ct.gov/caes/lib/caes/documents/publications/fact_sheets/plant_pathology_and_ecology/black_spot_of_rose.pdf.

Yonghao Li, 2016. Apple Scab. CAES Fact Sheet. http://www.ct.gov/caes/lib/caes/documents/publications/fact_sheets/plant_pathology_and_ecology/apple_scab.pdf.

Gent, M.P.N., Elmer, W.H., Macherla, K., and McAvoy, R.J. 2016. Management on growth and nutrient concentrations in poinsettia. HortScience 51(4):427–434.

ABSTRACT: Can regulated deficit irrigation in an ebb and flow system alleviate the effects of salinity stress on poinsettia? Two cultivars of poinsettia (*Euphorbia pulcherrima* Willd ex Klotzsch) were grown under partial- or full-saturation irrigation using a standard fertilizer solution, with or without the addition of 0.5 g·L-1 NaCl. The volumetric water content of the medium averaged 0.25 and 0.33 L·L-1 before irrigation, and 0.5 and 0.67 L·L-1 following irrigation, for partial- or full-saturation regimes, respectively. Plants had lower fresh weight with partial than full saturation. Sodium concentrations in bract, leaf, and stem tissues were higher ($P < 0.05$) in plants exposed to salinity, and these plants accumulated less K in stems and less P in bracts. Eight cultivars were grown in a second study with or without salinity of 1.2 g·L-1 NaCl under drip or ebb and flow watering. Cultivar

MS. LINDSAY PATRICK staffed a CAES/Plant Disease Information table during the public portion of the Bioblitz Event in East Hartford (June 4). The 2016 Connecticut Bioblitz exceeded all other Bioblitz events with a total of 2,765 species surpassing the world record of 2,519 species. Fifty one plant pathogens were identified by **DR. WADE ELMER**, **DR. DEWEI LI**, and **MS. LINDSAY PATRICK**.

New seasonal staff members in the Department of Plant Pathology and Ecology. From left, seasonal employee, **MS. LIANA WODZICKI** (working in the Plant Disease Information Office, PDIO); UConn Student intern, **MR. ALEX MASS** (working DR. WADE ELMER); visiting scientist, **DR. RAVI PATEL** (working with DR. QUAN ZENG); Quinnipiac University, CAPS student intern, **MR. DEREK LEJEUNE** (working with DR. LINDSAY TRIPLETT); and Southern Connecticut State University student intern, **MS. TALITA ROBERTSON** (working with DRS. ROBERT MARRA and LINDSAY TRIPLETT).

and watering had effects on plant fresh weight, but salinity did not. Of the cultivars tested, 'DaVinci', 'Premium Picasso', and 'Prestige Red' had the highest sodium in bracts under salinity with drip irrigation, whereas 'Snowcap' had the least. 'Ruby Frost' had the most sodium in stems, whereas 'Snowcap' had the least. For all cultivars, added salinity resulted in lower K in leaves and stem. Snowcap was the cultivar with the least sodium in stems and bracts under saline irrigation, with either drip or ebb and flow. Our research demonstrates that regulated deficit irrigation resulting in partial saturation of the growing medium is an effective water management option, when control of plant height and overall crop growth are desirable, and it limits the accumulation of sodium when raw water contains elevated salinity.

JOURNAL ARTICLES APPROVED JUNE 2016

Aulakh, Jatinder S. Herbicides for pre-emergence weed control in Christmas trees (reprinted from the CAES Fact Sheet). *The Real Tree Line*

Grubaugh, Nathan, Claudia Rueckert, **Philip Armstrong**, **Angela Bransfield**, **John Anderson,** Gregory Ebel, and **Doug Brackney**. Transmission bottlenecks and RNAi collectively influence tick-borne flavivirus evolution. *PLOS Biology*

LaMondia, James A. Connecticut Agricultural Experiment Station blue mold update. http://ctvalleytobacco.org

Li, Yonghao. Apple scab. *CAES Fact Sheet*

Li, Yonghao. Black spot of rose. *CAES Fact Sheet*

Noori, A., **Jason C. White**, and L. Newman. Mycorrhizal fungi influence Ag uptake and membrane protein gene expression following Ag nanoparticle exposure. *Journal of Nanoparticle Research*

Maynard, Abigail A. (2016) Specialty Eggplant Trials 2010-2012. Connecticut Agricultural Experiment Station Bulletin 1043. 10 pp.

Maynard, Abigail A. (2016) Specialty Pumpkin Trials 2009-2011. Connecticut Agricultural Experiment Station Bulletin 1044. 12 pp.

ARTICLES OF INTEREST JUNE 2016

GYPSY MOTH OUTBREAK 2016

Dr. Kirby C. Stafford III

The summer of 2016 saw another gypsy moth (*Lymantria dispar*) outbreak, which follows that in 2015 when approximately 180,000 acres were defoliated in Connecticut, mainly in Middlesex, New London, and Windham Counties. This year, many homeowners have reported 100% defoliation of oaks and some other tree species, particularly in eastern towns, and extensive defoliation is evident along many eastern CT roads. With the high density of gypsy moth caterpillars, even less favored species like spruce, pine and hemlock were stripped in some localities. Due to the lack of spring and early summer rains in southcentral and eastern areas of the state in 2015 and 2016, little or no activity by the gypsy moth fungus, *Entomophaga maimaiga*, was observed. However, there was some caterpillar mortality in areas of southcentral Connecticut this year. By contrast, high mortality in the caterpillars by *E. maimaiga* was obtained in more western areas of the state in 2015 where some summer rains allowed the fungus to infect the caterpillars. Aerial surveys by CAES will delineate the extent of defoliation in 2016 and later egg mass surveys will provide an indication of the scale of a likely outbreak again in 2017.

Gypsy moth activity, female moths laying their egg masses, and a defoliated tree in North Branford, CT (July 7, 2016).

GRANTS RECEIVED

Dr. Carole Cheah received a grant ($500) from the Connecticut Christmas Tree Growers Association to continue research on potential biological control of armored scales in Christmas tree plantations.

Mr. Gregory Bugbee, *2015 Invasive Aquatic Plant_Survey Of Lakes Candlewood, Lillinonah, Zoar And Squantz Pond*. First Light Power Resources. $84,016.

Executive Summary: The Connecticut Agricultural Experiment Station (CAES) Invasive Aquatic Plant Program (IAPP) has performed annual surveys of Lakes Candlewood, Lillinonah and Zoar for invasive aquatic vegetation from 2007 – 2014. These surveys and resulting reports fulfill requirements of the Housatonic River Project: Federal Energy Regulatory Commission (FERC) Project No. 2576. Yearly reports are submitted to FirstLight Hydro Generating Company. After approval by Technical Advisory Committee, reports are forwarded to FERC. The invasive species Eurasian watermilfoil (*Myriophyllum spicatum*), dominated the plant communities in the three lakes but was most troublesome in Lake Candlewood. Also present, in all three lakes were the invasive species minor naiad (*Najas minor*), and curlyleaf pondweed (*Potamogeton crispus*). A small population of invasive water shamrock (*Marsilea quadrifolia*) occurs only in Lake Zoar. In 2011 and 2012, we found the potentially destructive invasive plant water chestnut (*Trapa natans*) in Lake Lillinonah. Eurasian watermilfoil acreage in Lake Candlewood was 221 acres in 2007, 451 acres in 2008, 373 acres in 2009, 461 acres in 2010, 331 acres in 2011, 505 acres in 2012, 259 acres in 2013, and 477 acres in 2014. Deep drawdowns (10 feet), in the odd numbered years, resulted in the smaller acreages while shallow drawdowns (3 feet), in the even numbered years, resulted in the larger acreages. No drawdowns or other large-scale invasive plant control is used in Lake Lillinonah. Last year an herbicide application to Eurasian watermilfoil in Lake Zoar resulted considerable control. Squantz Pond is attached to Candlewood Lake has been requested to be included in 2015. Invasive Plant Monitoring Proposal – 2015 FirstLight Hydro Generating Company Page 2 of 3 Research Objective: CAES IAPP will survey Lakes Candlewood, Lillinonah, Zoar and Squantz Pond for invasive aquatic plants in 2015. The proposed research will be consistent with the objectives listed in the FERC Project No. 2576 Nuisance Plant Monitoring Plan, which satisfies FERC License Article 409, and fits within the overall research goals of the CAES IAPP. Gregory J. Bugbee, CAES IAPP principal investigator, will lead the work. CAES IAPP will determine the boundaries of all invasive aquatic plants in Lake Candlewood, Lake Lillinonah and Squantz Pond using geospatial technology, with sub-meter accuracy. Georeferenced underwater imagery will be used when necessary. In Lake Zoar the survey will be limited to 10 reference transects. Each stand of invasive plants will be assigned a qualitative density ranking and the water depth will be measured. Data will be uploaded to a geographic information system (GIS) and digitized maps will be created. Quantitative invasive and native aquatic plant abundance information will be obtained on previously established reference transects (80 meter transects containing 10 points 0, 5, 10, 20, 30, 40, 50, 60, 70 and 80 m from shore) in all three lakes. Water will be tested at georeferenced positions for Secchi transparency, temperature, dissolved oxygen, pH, alkalinity, conductivity, and total phosphorus. CAES IAPP will prepare a report to meet requirements of the FERC Nuisance Plant Monitoring Plan. The report will include aquatic plant survey maps, data, and a detailed description of our protocols. Invasive plant areas and mean patch size will be quantified and compared with previous year's findings. Included will an analysis of the effective-

ness of drawdowns to various depths and response of invasive plants to recently introduced herbivorous grass carp (*Ctenopharyngodon idella*). Suggestions on improving invasive aquatic plant management will be included. A draft report will be provided to the Technical; Advisory Committee by March 1, 2016 and their comments will be addressed in the final report to be provided to FirstLight Power Resources within 30 days. Subsequently, all information acquired as part of this study, including the contents of the final report, will be publicly available on the CAES IAPP website and by hard copy upon request.

Mr. Gregory Bugbee, *2016 Invasive Aquatic Plant Survey Of Upper And Lower Moodus Reservoir*. Town of East Haddam. $10,000.

Executive Summary: Provide a 2016 aquatic vegetation survey of the Upper and Lower Moodus Reservoir similar to that provided in 2009 and 2012 (see www.ct.gov/caes/iapp). The survey will begin in July and be led by Gregory J. Bugbee of The Connecticut Agricultural Experiment Station's Invasive Aquatic Plant Program. It will include complete vegetation mapping and cataloging of plant types on 300 points found on 30 previously established georeferenced transects. Water will also be tested for transparency, dissolved oxygen and temperature profile, pH, alkalinity, conductivity and total phosphorus. A written report will compare the survey with past years and suggests possible solutions to weed problems. An interactive webpage containing all maps and other data will be established. Results will be reported at a fall stakeholder meeting.

CAES

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