

Station News

The Connecticut Agricultural Experiment Station

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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

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JASON C. WHITE, PH.D. hosted Professor Jorge Gardea-Torresdey of the University of Texas El Paso for a Lockwood lecture and for discussions on current and future collaborations with CAES (October 1- 5); along with **Nubia Zuverza-Mena, Ph.D.** and **Sara Nason, Ph.D.** participated in a Zoom meeting with collaborators at Yale University and the University of Minnesota for a joint NIEHS grant (October 1); along with **CHRISTIAN DIMKPA, PH.D.** and **Hina Ashraf, Ph.D.** met by Zoom with collaborators at Johns Hopkins University to discuss joint research work (October 1); participated in the weekly NSF Center for Sustainable Nanotechnology (CSN) all hands call by Zoom (October 2, 9, 16); met with collaborators at the University of Minnesota and Convergent Bioscience to discuss joint experiments (October 2, 16); participated by Zoom in the bi-monthly Farmland Preservation Advisory Board meeting (October 2); along with **Nubia Zuverza-Mena, Ph.D.** and **Milica Pavlicevic, Ph.D.** met by Zoom with collaborators at the University of Texas El Paso and the University of Rhode Island to discuss a joint USDA project (October 3); along with **Yi Wang, Ph.D.** met by Zoom with collaborators at Louisiana State University and the University of Auckland to discuss a joint USDA project (October 3); along with **Chaoyi Deng, Ph.D.** and **Hina Ashraf, Ph.D.** attended the CSN All Hands in person meeting at the University of Illinois Urbana-Champaign (October 6-8); along with Mr. Michael Last hosted the quarterly CAES Board of Control meeting at the Valley Laboratory (October 9); gave a Zoom presentation on nanotechnology as part of the 2024 National Nano Day to students at the Dr. Martin Luther King Jr. Middle School in San Francisco CA (October 9); along with **Chaoyi Deng, Ph.D.** and **Hina Ashraf, Ph.D.** met by Zoom with colleagues at the École Polytechnique Fédérale de Lausanne in Switzerland to plan collaborative experiments (October 10); along with **Chaoyi Deng, Ph.D.** met by Zoom with colleagues at the University of Minnesota to discuss collaborative research (October 10, 30); spoke by Zoom with staff scientists at USDA NIFA about the Closer-to-Zero initiative (October 10); along with **Raja Muthuramalingam, Ph.D.** and **CHRISTIAN DIMKPA, PH.D.** met by Zoom with colleagues at Carlton University to discuss collaborative research (October 11); along with **Sudhir Sharma, Ph.D.** met with collaborators at Columbia University to discuss a joint USDA project (October 14); along with **Anuja Bharadwaj, Ph.D., Terri Arsenault** and **CHRISTIAN DIMKPA, PH.D.** met with staff of DCP Drug Control to discuss the Adult Use Marijuana testing program (October 15); gave a tour of CAES and described programs for a group of students and teachers from Foundation High School (October 18); attended the 18th International Phytotechnologies Conference at the University of Calicut in Kerala India and gave a presentation entitled “Nanobiotechnology-based Strategies for Climate Resilient Crops”, as well as to Pocker Sahib Memorial Orphanage College and Korambayil Ahamed Haji Memorial Unity Women’s College (October 20-25); along with **Nubia Zuverza-Mena, Ph.D.** and **Mandeep Kaur, Ph.D.** met by Zoom with collaborators at Rutgers University and the New Jersey Institute of Technology to discuss progress on a joint project (October 28); hosted the quarterly meeting of the CAES Board of Control Executive and Finance Committee by Zoom (October 29); hosted two diplomats from the Indian Embassy in Washington DC and discussed ways to increase collaborations between Indian Universities and CAES (October 29); and attended an event at Jones Family Farm celebrating the protection of 50,000 acres statewide since the inception of the farmland preservation program in 1979 (October 30).

PUBLICATIONS:

1. Jiang, Y.; Sun, Y.; Zhou, P.; **White, J. C.**; Rui, Y.; Zhang, P. (2024). Recycled lithium battery nanomaterials as a sustainable nanofertilizer: Reduced peanut allergenicity and improved seed quality. *Sci. Total. Environ.* Volume 955, 176900. DOI: [10.1016/j.scitotenv.2024.176900](https://doi.org/10.1016/j.scitotenv.2024.176900)

Abstract: The rapidly increasing amount of end-of-life lithium iron phosphate (LiFePO₄) batteries has raised significant environmental concerns. This study offers a strategy for a paradigm shift by transforming this growing waste into a valuable resource by recycling discarded LiFePO₄ batteries and safely integrating the materials into sustainable agriculture. We used five types of LiFePO₄ (10, 50 mg kg⁻¹) applied to soil planted with peanuts in a full-culture experiment. Our results show that addition of <50 mg kg⁻¹ of recycled nano-LiFePO₄ (rn-LiFePO₄) has a multifaceted positive impact on peanut because of sustainable release of nutrients and nano-specific effects, not only enhancing photosynthesis and root growth but also increasing yield by 22 %–34 % while simultaneously elevating seed nutritional quality. Moreover, a remarkable reduction (up to 99.78 % at 10 mg kg⁻¹ rn-LiFePO₄) in the expression of allergen genes was evident following exposure to LiFePO₄, which showed a significant negative correlation with Fe content in the seeds. The decreased peanut allergen gene expression was mediated by a downregulation of metabolites associated with protein digestion and absorption. Furthermore, rhizosphere soil immune system enhancement may indirectly enhance immune responses to peanut allergy. This study suggests the significant potential of nanoscale LiFePO₄ recycled from Li battery, including enhancing crop yield quality and mitigating peanut allergy concerns while simultaneously addressing a growing waste stream of concern.



Attendees at the 18th International Phytotechnology Conference, including **Jason C. White, Ph.D.**, **Sudhir Sharma, Ph.D.**, **Mandeep Kaur, Ph.D.**, **Milica Pavlicevic, Ph.D.**, **Paul Aikpokpodion, Ph.D.**, and **Raja Muthuramalingam, Ph.D.**



Jason C. White, Ph.D. at the Pocker Sahib Memorial Orphanage College (above) and Korambayil Ahamed Haji Memorial Unity Women's College (below).



PAUL AIKPOKPODION, PH.D. as a “Phytoscholar awardee” attended the 18th edition of the International Phytotechnology Conference (IPC-18) in Kerala, India; he presented a talk titled “Cellulose nanofiber-containing effluent of Nitro-oxidation Process (NOP) and its influence on nitrogen loss mitigation in a plant-soil system”. About 150 participants from 19 countries attended the conference (October 22-24).

ANUJA BHARADWAJ, PH.D. gave a talk titled "Analysis of Marijuana Products" at the Sigma Xi, The Scientific Research Honor Society, Quinnipiac Chapter Seminar Series, Hamden, CT (40 participants) (October 23).

MANDEEP KAUR, PH.D. participated in International Phytotechnology Conference (IPC-18) held in at India. The title of her poster was "Effect of polyvinyl chloride microplastics (PVC-MP) on the translocation of heavy metals and other pollutants in *Lactuca Sativa* L (October 22-24).

RAJA MUTHURAMALINGAM, PH.D. attended and presented at IPC 18 in India as part of his “Phytoscholar” travel award. He delivered a presentation on his research titled “Nano-enabled RNA interference and ultrasensitive detection for comprehensive management of plant viral diseases,”. The conference hosted nearly 150 participants, including 40 attendees representing 19 different countries (October 22-24).

MILICA PAVLICEVIC, PH.D. participated in International Phytotechnology Conference (IPC-18) held in at India. She gave a talk titled “Reimagining plant waste- using hemp waste for the green synthesis of “green” nanofertilizers and nanopesticides” (150 participants) (October 22-24).

CARLOS TAMEZ, PH.D., participated in the Association of Official Analytical Collaboration Cannabis Analytical Science Program (AOAC CASP) Pesticide Think Tank monthly meeting. The think tank focuses on providing resources and guidance for laboratories to develop LC and GC based pesticide residue monitoring programs for cannabis and other matrices (October 29).

PUBLICATIONS:

1. Muthuramalingam, R., da Silva, W. L., Zuverza-Mena, N., Dimkpa, C., White, J. C. (2024). Nano-sized metal oxide fertilizers for sustainable agriculture: balancing benefits, risks, and risk management strategies. *Nanoscale* DOI: [10.1039/D4NR01354A](https://doi.org/10.1039/D4NR01354A)

Abstract: This critical review comprehensively analyses nano-sized metal oxide fertilizers (NMOFs) and their transformative potential in sustainable agriculture. It examines the characteristics and benefits of different NMOFs, such as zinc, copper, iron, magnesium, manganese, nickel, calcium, titanium, cerium, and silicon oxide nanoparticles. NMOFs offer unique advantages such as increased reactivity, controlled-release mechanisms, and targeted nutrient delivery to address micronutrient deficiencies, enhance crop resilience, and improve nutrient efficiency. The review underscores the essential role of micronutrients in plant metabolism, crop growth, and ecosystem health, highlighting their importance alongside macronutrients.

NMOFs present significant benefits over traditional fertilizers, including enhanced plant uptake, reduced nutrient losses, and decreased environmental impact. However, the review also critically examines potential risks associated with NMOFs, such as nanoparticle toxicity and environmental persistence. A comparative analysis of different metal types used in nanofertilizers is provided, detailing their primary advantages and potential drawbacks. The review emphasizes the need for cautious management of NMOFs to ensure their safe and effective use in agriculture. It calls for comprehensive research to understand the long-term effects of NMOFs on plant health, soil ecosystems, and human health. By integrating insights from material science, plant biology, and environmental science, this review offers a holistic perspective on the potential of NMOFs to address global food security challenges amid resource constraints and climate change. The study concludes by outlining future research directions and advocating for interdisciplinary collaboration to advance sustainable agricultural practices and optimize the benefits of NMOFs.

2. Kadri, O., Dimkpa, C. O., Chaoui, A., Kouki, A., Amara, A. B. H., Karmous, I. (2024). Zinc oxide nanoparticles at low dose ameliorate lead toxicity in pea (*Pisum sativum* L.) by modulating metabolic and cellular defense systems. *Journal of Agricultural and Food Research*. DOI: [10.1016/j.jafr.2024.101482](https://doi.org/10.1016/j.jafr.2024.101482)

Abstract: Addressing lead (Pb) pollution and contamination in soil and agriculture is urgent due to its widespread and long-lasting impacts on human health, food safety, and the environment. In the current study, we assessed the potential use of Zinc oxide nanoparticles (ZnONPs) in alleviating Pb toxicity in germinating seedlings. Pea (*Pisum sativum* L.) seedlings were exposed to Pb (83 mg/L) over a 7-day period, without and with ZnONPs amendment. Our results showed that the application of ZnONPs at 10 mg/L restored the morphological parameters affected by Pb, 34 %, 26 % and 23 %, for the length, fresh, and dry biomass of embryonic axis, respectively. ZnONPs decreased the activities of antioxidative enzymes of catalase (87.5 %), guaiacol peroxidase (60 %), and glutathione peroxidase (25 %), but increased the activities of ascorbate peroxidase (60 %) and glutathione reductase (25 %). These changes were associated with the increase (7 %) in the thiol groups, and reductions in the malondialdehyde (23 %), hydrogen peroxide (33 %), and carbonyl group levels (78 %), in addition to the stimulation of the activities of ROS-associated enzymes, including glycolate oxidase (40 %) and NADPH oxidase (by 89 %). Consequently, cell viability was increased by 66 %, while cellular death was reduced by 10 %, with ZnONPs, relative to the Pb-stressed seedlings. These findings highlight the mechanisms surrounding the ability of nanosized ZnO to mitigate the harmful effects of Pb on the growth and physiology of plants. Further investigation is needed to understand the mitigating effects of ZnONPs on Pb on the molecular and genomic levels in seedlings and plants, and ensure the sustainability of agricultural practices and food safety. Besides, site and source-specific integrated approaches must be practiced to formulate suitable remediation strategies.



Attendees at the 18th International Phytotechnology Conference, including **Paul Aikpokpodion, Ph.D.**, **Raja Muthuramalingam, Ph.D.**, **Jason C. White, Ph.D.**, **Milica Pavlicevic, Ph.D.**, **Mandeep Kaur, Ph.D.**, and **Sudhir Sharma, Ph.D.**



PHILIP ARMSTRONG, SC.D. spoke with reporters from News Channel 8 about the continuing risk of EEE virus in Connecticut (October 4); gave a guest lecture on parasitic diseases for an undergraduate course on vector-borne diseases at SCSU (October 7); hosted professor Dr. Jean Tsao from Michigan State University at CAES (October 8); talked to reporter from Stateline News about the EEE virus outbreak (October 9); participated in the Northeast Center for Excellence in Vector Borne Diseases and Training and Evaluation Center's Leadership Committee meeting (October 15); participated in a debriefing meeting with officials from CT DPH, DEEP, and local health districts about the 2024 mosquito season and best practices to respond to EEE and West Nile virus disease outbreaks (October 29).

TIA M. BLEVINS attended the 2024 Fall Interstate Inspection of the Horticultural Inspection Society-Eastern Chapter in Concord, New Hampshire (September 30- October 2).

ANGELA BRANSFIELD participated via Zoom in Yale University's Biosafety Committee meeting (Oct 17); and participated in the Federal Select Agent Program's Responsible Official webinar "FSAP Inspection Overview; Analysis of FSAP Inspection Report Departures" (Oct 24).

HANY DWECK, PH.D. participated in the NE2001 multistate meeting at Cornell University (October 7-8); Presented a talk on "Evolution of Olfaction of *Drosophila suzukii*" (30-40 attendees) (October 7).

KELSEY E. FISHER, PH.D. served as an Entomological Society of America Science Policy Fellow in Washington D.C. and met with staff from the Department of Homeland Security Office of Health Security, USAID, USDA, the White House Office of Science and Technology Policy, Environmental Protection Agency Office of Pesticide Programs, and the Division of Parasitic Diseases and Malaria at the Centers for Disease Control and Prevention (Oct 7-9); presented "Monarch butterfly biology, ecology, and conservation needs" for high school biology teachers that have students enrolled in the UConn Early College Experience (Oct 15); presented a poster and attended the New England Tree Fruit Integrated Pest Management working group meeting in Northampton, MA (Oct 22-23); provided a state update for the Integrated Resistance Management working group run through the EPA (Oct 28); presented about monarch butterfly conservation research work conducted at the CT DEEP property "Robbins' Swamp" at the CT Invasive Plant Working Group meeting at UConn (Oct 29).

ANDREA GLORIA-SORIA, PH.D. Gave invited lectures "Evolución y marcadores genéticos de los mosquitos *Aedes aegypti*" and "*Competencia vectorial de los mosquitos Aedes spp para transmitir arbovirus*" (Spanish) at the "New insights in dengue and other arboviruses: from molecular biology to public health" workshop hosted by the Research Center for Infectious Diseases at the National Instituto of Public Health in Cuernavaca, Mexico (40 student attendees; 20 professional attendees) (September 30 – October 4); participated together with two other women scientist in outreach research panel: El dengue y otros virus transmitidos por mosquitos. ¿Es posible evitar su avance? (Spanish). Broadcasted by the School of Public Health in Cuernavaca, Mexico via social media (October 7); presented the talk "Diversity of the *Aedes aegypti* group in the Southwest Indian Ocean" at the European Society of Vector

Ecology annual meeting in Montpellier, France (300 attendees) (October 14-17); attended the Aegypti Southwest Indian Ocean annual team meeting at Montpellier, France (13 attendees) (October 17-18); gave the lecture “Vector Population Genetics and Control”, as part of the BIO337/598 Medically Important Arthropods course offered by Southern Connecticut State University (18 students, 1 professor) (October 28).

MEGAN LINSKE, PH.D. gave a guest lecture titled “Tick Biology, Ecology, and Behavior” at Central Connecticut State University (12 attendees) (Oct 1); co-hosted the Wildlife Society Leadership Institute Committee meeting as Co-Chairperson (Oct 11); gave a presentation titled “Diversity and Disease: Assessing Backyards for Tick Bite Prevention and Awareness” for the University of Connecticut Early College Experience Workshop (45 attendees) (Oct 15); participated in a call with staff from the Centers for Disease Control and Prevention’s Division of Vector-Borne Diseases on progress made on a funded integrated tick management and seasonal spray projects (Oct 16); participated in the Northeast Section of the Wildlife Society Fall Meeting as Workshop Chairperson (Oct 20); hosted the Diversity, Equity, and Inclusivity workshop for the Class of 2024 Leadership Institute Program at the Wildlife Society Conference in Baltimore, MD (12 attendees) (Oct 22); participated in a meeting with collaborators from BanfieldBio, Inc. and North Carolina State University to discuss blacklegged tick repellency trials and developments for the upcoming field season (Oct 29); was featured in an Entomological Society of America’s “[Entomology Today](#)” article highlighting seasonal applications of acaricides for effective blacklegged tick management while minimizing non-target mortality in residential settings (Oct 31).

CHRIS MAIER, PH.D. was appointed to another 5-year term as a Curatorial Affiliate in Entomology at the Peabody Museum of Yale University (October 1).

GOUDARZ MOLAEI, PH.D. was interviewed by Brian Scott-Smith, Journalist & Broadcaster - Media Consultant (October 1), and WTNH (October 2) about the discovery of new Rickettsial disease in Connecticut, which was published by the CDC *Emerging Infectious Diseases (EID)*; met with Paul Wolujewicz, PhD, School of Health Sciences, Quinnipiac University, to discuss progress on our joint project assessing the feasibility of nanopore-based metagenomic approach for high throughput pathogen screening in tick vectors of human and veterinary diseases (October 4); attended the monthly meeting of the longhorned tick, *Haemaphysalis longicornis*, and discussed this tick activity in CT (October 7); presented a lecture on tick-borne diseases at the Central Connecticut State University (October 8); presented a lecture on ticks and tick borne-diseases which included biology, phenology, and ecology of ticks and pathogens they transmit, tick and tick-borne disease surveillance, tick control methods, and personal protection, to the University of Connecticut Extension, College of Agriculture, Health And Natural Resources (October 16); and attended the Yale Monthly Biological Safety Committee Meeting (October 17).

JACOB RICKER participated in Eastern Horticultural Inspection Society’s fall Interstate Inspection Meeting in Concord, New Hampshire (September 30 - October 2).

CLAIRE RUTLEDGE, PH.D. taught two session of the Connecticut Tree Protective Association’s Arboriculture 101 (45 students) (October 10, October 24) at Jones Auditorium.

JOHN SHEPARD presented the lectures, “Mosquito & Arbovirus Surveillance” and

“Mosquito Control & Prevention of Mosquito-Borne Disease” for the course, BIO 337 – Medically Important Arthropods, at Southern Connecticut State University (20 students, 1 faculty) (October 13, October 20).

KIRBY C. STAFFORD III, PHD presented a talk on the Prevention and Management of Ticks and Tickborne Disease for the Illinois Tickborne Disease Conference in Champaign, IL via WebEx (October 22).

KIMBERLY STONER, PHD participated in the CT State Technical Committee of the Natural Resource Conservation Service, Tolland, CT (23 adults) (October 30).

PAULA WOLF co-presented the 2024 Northeast Honeybee Update Lunch and Learn for beekeepers throughout New England (October 4); participated in the Eastern Connecticut Beekeepers Association meeting, connecting with beekeepers regarding the logistics of scheduling inspections and the importance of hive registration (47 participants) (October 5); co-presented a workshop on Microscopy for the Back Yard Beekeepers Association. Attendees practiced dissection of honeybees, inspecting pollen and surveying for disease (10 attendees) (October 6); spoke at the Connecticut Beekeepers Association’s Bee Talks meeting about current pesticide regulations and growing honeybee pests (October 10); participated in the Worcester County Beekeepers Fall Conference (October 19).

TRACY ZARRILLO met with Pete Picone from CT-DEEP to discuss a potential collaboration involving a meadow augmentation project in Goshen, CT (October 4); presented an invited talk titled “The Story of the Lost Chestnut Bee, *Andrena rehni*” at the Annual Meeting of the American Chestnut Foundation, Courtyard by Marriot, Cromwell, CT (45 adults) (October 26); presented an invited talk titled “Pollinator Meadows at Robbins Swamp Wildlife Management Area Help Support Native Wild Bees and Monarchs” with **Kelsey Fisher, Ph.D.** and Pete Picone from CT-DEEP at the Connecticut Invasive Plant Working Group 2024 Symposium” (75 attendees) (October 26).

PUBLICATIONS:

1. Molaei, G., Khalil, N., Ramos, C. J., and Paddock, C. D. (2024). Establishment of *Amblyomma maculatum* Ticks and *Rickettsia parkeri* in the Northeastern United States. *Emerg Infect Dis.*;30(10):2208-2211. DOI: [10.3201/eid3010.240821](https://doi.org/10.3201/eid3010.240821)

Abstract: We document a case of *Rickettsia parkeri* rickettsiosis in a patient in Connecticut, USA, who became ill after a bite from a Gulf Coast tick (*Amblyomma maculatum*). We used PCR to amplify *R. parkeri* DNA from the detached tick. The patient showed a 4-fold rise in IgG reactive with *R. parkeri* antigens.

2. Ferdous, Z., Dieme, C., Sproch, H., Kramer, L. D., Ciota, A. T., Brackney, D. E., Armstrong, P. M. (2024). Multiple bloodmeals enhance dissemination of arboviruses in three medically relevant mosquito genera. *Parasites & Vectors* 17(1):432. DOI: [10.1186/s13071-024-06531-y](https://doi.org/10.1186/s13071-024-06531-y)

Abstract: Background: Mosquitoes in nature may acquire multiple bloodmeals (BM) over the course of their lifetime; however, incorporation of frequent feeding behavior in laboratory

vector competence studies is rarely done. We have previously shown that acquisition of a second non-infectious BM can enhance early dissemination of Zika virus (ZIKV), dengue virus, and chikungunya virus in *Aedes aegypti* and ZIKV in *Aedes albopictus* mosquitoes, yet it is unknown if other taxonomically-diverse virus-vector pairings show a similar trend under a sequential feeding regimen. **Methods:** To test this, we evaluated the impact of a second noninfectious BM on the vector competence of *Aedes aegypti* and *Anopheles quadrimaculatus* for Mayaro virus, *Culex quinquefasciatus* for West Nile virus, *Aedes triseriatus* for La Crosse virus, and *Aedes aegypti* for Oropouche virus (OROV). Female mosquitoes were fed BMs containing these viruses and half of them were given a second noninfectious BM at 3 or 4-days post infection. Mosquitoes were harvested at various time points and assayed for virus infection in bodies and disseminated infection in legs by performing reverse transcription-quantitative polymerase chain reaction (RT-qPCR) assays. **Results:** We found that a second noninfectious BM had no impact on midgut infection rates but increased virus dissemination for all but one of the virus-vector pairings- *Ae. aegypti* and OROV. Unlike the other arboviruses under consideration, which are strictly mosquito-borne, biting midges (*Culicoides* spp.) serve as the main vector of OROV and this virus rarely disseminated to the mosquito leg tissue in our study. **Conclusions:** Taken together, our findings show that sequential blood feeding enhances virus dissemination across diverse arbovirus-vector pairings, representing three mosquito genera and virus families, but a second BM was insufficient to overcome a strong midgut virus escape barrier in a nonnatural virus-vector pairing.

3. Fisher, K. E., Filandro, A., Bradbury, S. P., Wanamaker, A., Coates, B. (2024). Breeding season temporal and spatial trends in continental-scale migration of the monarch butterfly. *Environmental Entomology*. DOI: [10.1093/ee/nvae076](https://doi.org/10.1093/ee/nvae076)

Abstract: The monarch butterfly (*Danaus plexippus*) is a vagile species that undertakes an annual, multi-generational migration across North America. The abundance of this species at both eastern and western overwintering sites in Central Mexico and California indicates a population decline. Success of continental-scale conservation programs for a migratory species depends on providing, maintaining, and protecting habitats at appropriate temporal and spatial scales. Here, dynamics of monarch continental-scale migration and gene flow were obtained by combined stable isotope, morphological, and genetic analyses. These analyses were applied to temporal monarch samples collected from May to September during 2016–2021 at locations in Iowa, USA and spatial collections from Pennsylvania, Delaware, Iowa, Ohio, Nevada, Idaho, Hawaii, 3 Australian locations during July and August 2016, and Texas in April 2021. Evidence of seasonal multi-generational migration was obtained through $\delta^2\text{H}$ analyses of spatial collections, which was corroborated by decreased wing hue (a morphological marker for non-migratory individuals). In Iowa, 10–15% of monarchs represented migrants from southern areas throughout the breeding season and 6% were migrants from the North in midsummer. Limited sequence variation detected across the mitochondrial genome impacted the capability to detect significant population genetic variation in our North American samples. However, 2 novel substitutions were identified and predicted to be fixed among Australia samples, contributing to intercontinental differentiation from counterparts in North America. Our assessment of temporal and spatial population dynamics across the North American monarch breeding range provides insight into continental-scale migration and previously undetected mitochondrial DNA variation among globally distributed populations.

4. Havill, J., Strasburg, O., Udoh, T., Crawford, J. E. and Gloria-Soria, A. (2024). EVE-

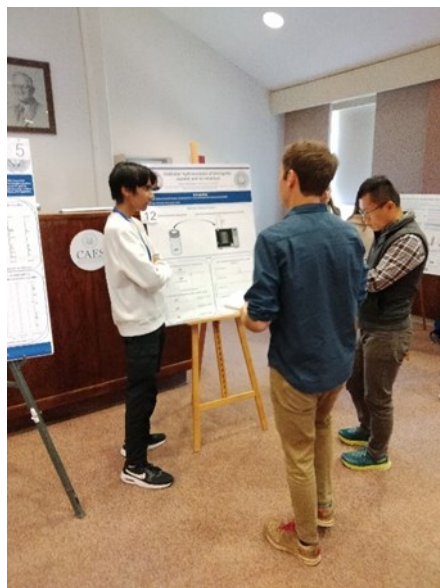
X: Software to Identify Novel Viral Insertions in Wild-Caught Arthropod Hosts from Next-Generation Short Read Data. *Molecular Ecology Resources*, p.e14026. DOI: [10.1111/1755-0998.14026](https://doi.org/10.1111/1755-0998.14026)

Abstract: Eukaryotic genomes harbour sequences derived from non-retroviral RNA viruses, known as endogenous viral elements (EVEs) or non-retroviral integrated RNA virus sequences (NIRVS). These sequences represent a record of past infections and have been implicated in host anti-viral response. We have created a program to identify viral sequences integrated in a host genome. It begins with a specimen BAM file and outputs candidate NIRVS, along with putative host insertion sites and overlapping genomic features of the host genome in XML and visual formats, with minimal intermediary intervention. We ran through this software short-read data derived from the genomes of 222 wild-caught *A. aegypti* mosquitoes, from a dozen geographical regions, and located putative NIRVS from seven virus families. This program is as accurate as currently available software for NIRVS detection, and represents a significant improvement in adaptability and user-friendliness. Furthermore, the flexibility of this pipeline allows the user to search for sequence integrations across the genome of any organism, as long as a query sequence database and a reference genome is provided. Potential extended applications include identification of integrated transgenic sequences used for research or vector control strategies.

DEPARTMENTAL EVENTS:

2nd Annual CAES Postdoctoral Scientist Research Symposium

The 2nd Annual CAES Postdoctoral Scientist Research Symposium was held on October 11th in Jones Auditorium and featured 7 short talks, 20 poster presentations and keynote speaker presentation by Dr. Vivian Irish, Daniel C. Eaton Professor of Molecular, Cellular & Developmental Biology and Professor of Ecology & Evolutionary Biology, Yale University on “Thorny Questions: Citrus Development and Disease”. **Jessica Brown, Ph.D.** (Dept. of Environmental Science & Forestry) won the oral presentation competition with her talk “Understanding host-tick interactions in three small mammal species” followed by **Jing Yuan, Ph.D.** (Dept. of Environmental Science & Forestry) with her talk “Nanopore Sequencing for Corn Rhizosphere Soil Microbiome Affected by Phosphorous Nanoparticle Fertilizers”. Poster presentation winner was **Stephen Taerum, Ph.D.** (Dept. of Plant Pathology & Ecology) presenting “Protists help shape plant microbiomes” and followed by **Godfrey Indinda Nattoh, Ph.D.** (Dept. of Entomology) presenting “The scavenger receptor protein class B type 1 (SR-B1) mediates dengue virus infection of *Aedes aegypti* mosquito” and **Ravikumar Patel, Ph.D.** (Dept. of Plant Pathology & Ecology) presenting “Soil protists harbor diverse novel bacteria that modulate growth via auxin signaling”. Many thanks to **DRS. David Giesbrecht, Rebecca Johnson, Stephen Taerum, & Ravikumar Patel** for planning and running this event and to abstract, oral presentations and poster judges **DRS. PHIL ARMSTRONG, Anuja Bharadwaj, Doug Brackney, Greg Bugbee, Hany Dweck, Kelsey Fisher, Goudarz Molaie, Raquel Rocha, Neil Schultes, Itamar Shabtai, LINDSAY TRIPLETT, Elisabeth Ward, Nate Westrick, Leigh Whittinghill, SCOTT WILLIAMS, Quan Zeng.** (~100 people attended).



DRS. Nate Westrick & Quan Zeng listen to Raghav Bharadwaj (Dweck Lab) present his poster on SWD at the Postdoctoral Scientist Symposi-



Godfrey Indinda Nattoh, Ph.D. explains his research on receptor protein interactions in dengue virus infection of *Aedes aegypti*.



Tia Blevins and **Jacob Ricker** attended the Horticultural Inspection Society-Eastern Chapter's annual interstate inspection event in Concord, NH where they participated in a survey for beech leaf disease in Bear Brook State Park, Allenstown, NH.



On Saturday October 5, 2024, **Duncan Cozens** and Victoria Flood were married at St. Luke's Episcopal Church in Somers, NY.

SCOTT WILLIAMS, PH.D. met via Zoom with collaborators from MaineHealth and Columbia University on an ongoing integrated tick management project (October 1); participated in a collaborative Zoom call with members of the Banfield Biologic NIH SBIR-funded tick repellent fabric team (October 1); participated in a call with staff from White Buffalo, Inc. on an ongoing integrated tick management project (October 3); along with other staff from CAES, met with Dr. Jean Tsao from Michigan State University to discuss vector/pathogen ecology and management in the Northeast (October 8); attended a talk at Yale University by Dr. Jean Tsao on host-targeted tick management strategies and research (October 9); participated in a conference call with staff from Genesis Laboratories, Inc. regarding ongoing integrated tick management research projects (October 10); gave invited lecture on integrated tick management in backyard habitats to environmental science high school teachers participating the University of Connecticut's Early College Environmental Science Experience (October 15) (75 attendees); participated in a collaborative Zoom call with members of the Banfield Biologic NIH SBIR-funded tick repellent fabric team (October 15); participated in a Zoom call with staff from the CDC Division of Vector-Borne Diseases on progress made on a funded integrated tick management project (October 16); spoke over Zoom with Clay McRee on possibility of testing the efficacy of tick repellent fabric (October 17); at the National Meeting of the Wildlife Society in Baltimore, MD, as Executive Treasurer, participated in the Executive Committee Meeting of The Northeast Section (October 20), as the Northeast Section representative, participated in meetings of the Professional Certification Review Board on October 22 and October 23 (October 20-23); participated in a Zoom call with staff from CAES and USDA Forest Service and other members of the oak wilt working group (October 25); ongoing integrated tick management project in Woodbridge and Bethany was listed as one of Connecticut Magazine's 2024 Innovators (October 28); participated in a collaborative Zoom call with members of the Banfield Biologic NIH SBIR-funded tick repellent fabric team (October 29); participated in a trainee seminar over Zoom for the Northeast Center for Excellence in Vector-Borne Diseases Training and Evaluation Center (October 31); wrote a short piece highlighting a recent publication on the utility of a pollinator-friendly, novel fall acaricide application for management of blacklegged ticks in residential backyards for the Entomological Society of America's "Entomology Today" (October 31).

NATALIE BAILEY participated in a collaborative Zoom call with members of the Banfield Biologic NIH SBIR-funded tick repellent fabric team (October 29); assisted with a guest lecture at Central Connecticut State University titled "Making it sTick: Tick Surveillance, Control, and Disease Prevention" (14 attendees) (October 29).

JOSEPH P. BARSKY led the "Forest Biodiversity Hike" for the Sleeping Giant State Park Association's hiking program (October 5); was interviewed by Braley Dodson of WTNH regarding the results of the 2024 Connecticut Oak Mast Surveillance Program (October 17); attended the Massachusetts Society of American Foresters Fall Field Tour (October 24); interviewed by Jennifer Aherns from Connecticut Public Radio on 2024 acorn abundance in Connecticut (October 24); participated in the 2025 NESAF Annual Winter Meeting Planning Committee meeting (October 30, virtual), along with Elisabeth Ward, participated in the Forest Ecosystem Monitoring Cooperative State Partnership Conference Call (October 31, virtual), was interviewed by Jesse Leavenworth of Heart Connecticut Media regarding the results of the 2024 Connecticut Oak Mast Surveillance Program (October 31).

JESSICA BROWN, PH.D. presented a talk titled "Understanding Tick-Host Interactions in Three Rodent Species" at the CAES Postdoctoral Research Symposium (October 11); at the National Meeting of The Wildlife Society in Baltimore, MD, as member-at-large, participated in the committee meeting of The Northeast Section (October 20), as the Northeast Section committee chair, participated in a meeting of the Conservation Affairs Network (October 22);

presented a guest seminar at Central Connecticut State University titled “Making it sTick: Tick Surveillance, Control, and Disease Prevention” (14 attendees) (October 29).

GREGORY J. BUGBEE Interviewed by Ed Mahoney of the Hartford Courant on hydrilla in the Connecticut River (October 3) resulting in a frontpage article appearing on October 7th; participated (virtually) in the USACE/ MADCR Hydrilla Demo Project Expansion Planning Committee Meeting (October 3); participated in the CT DEEP Aquatic Invasive Species Task Force quarterly meeting (October 7); participated in the CT Legislative Terramation Committee (October 8); participated in the CT Invasive Plant Working Group Steering Committee (October 10); participated in the Hamburg Cove Hydrilla Management Group Meeting (October 15); judged the CAES Post-Doc Symposium Poster Session in the Jones Auditorium (October 11); gave an invited virtual talk entitled “Hydrilla in the Connecticut River – The Case for United States Army Corps of Engineers Assistance” to the Massachusetts Resource Agency Workshop (30 attendees) (October 24); gave an invited talk entitled “Invasive Aquatic Plants in Connecticut” at the Connecticut Invasive Plant Working Group Symposium at UCONN (75 attendees) (October 29).

RILEY DOHERTY launched the CT Aquatic Invasive Species Web Application to the public (October 2); participated (virtually) in the CT DEEP Aquatic Invasive Species Task Force quarterly meeting (October 7); participated in the Hamburg Cove Hydrilla Management Group meeting (October 15); participated in the Connecticut Federation of Lakes monthly board meeting (October 16); participated as Secretary in the CAES DEI committee meeting (October 22); attended the Northeast Arc Users Group Conference in Burlington, VT (October 28-30) and presented on “Visualizing Aquatic Invasive Species in Connecticut with ArcGIS Experience Builder” (40 attendees) (October 30).

JEREMIAH FOLEY, PH.D. was interviewed by the Hartford Courant for the article "Weed removal: Stakes are high in getting rid of hydrilla on river" (October 7); provided an update to the Eightmile River Watershed on the impact and spread of Hydrilla in Hamburg Cove (October 8); participated in a Natural Diversity Data Base Survey with Dr. Don Padgett along the Connecticut River (October 18); served as a panelist for the CT River Museum to collect stakeholder feedback for next year's Environmental Symposium and discuss successes and challenges to enhance River Stewardship (October 21); presented a lecture on the arrival and impact of Connecticut River hydrilla to the Connecticut Invasive Plant Working Group (CIPWG) (October 29).

SUSANNA KERIÖ, D.SC. met with **Elisabeth Ward, Ph.D.** and **Nathan Westrick, Ph.D.** from CAES and Elena Karlsen-Ayala to discuss a grant proposal for biocontrol of chestnut blight (October 1); met with UConn assistant professors Drs. Cinnamon Dobbs, Mayra Rodriguez-Gonzalez and Chandi Witharana with **Elisabeth Ward, Ph.D.** to discuss a grant proposal on landscape tree health for the Specialty Crop Research Initiative (October 7); hosted a group of 12 students from Wesleyan University with Dr. Elaine Gan at Lockwood Farm for a tour of a chestnut biocontrol plot (October 8); met with the President Jack Swatt of the Connecticut Chapter of The American Chestnut Foundation (TACF) at Lockwood Farm and Sleeping Giant chestnut orchards to plan field tours for the Symposium of TACF (October 9); met with two students to discuss potential internship opportunities at CAES (October 11 and October 16); gave a talk titled “Mycorrhizal Inoculations on Urban Trees” at The Rockfall Foundation’s event in Middletown (October 19) (25 attendees); met with Elodie Eid working with the Northern Nut Growers Association regarding the documentation of the Sleeping Giant Chestnut Orchards (October 23); gave a field tour of the Sleeping Giant and Lockwood Farm chestnut orchards including Connecticut foresters, nut growers, and TACF staff and volunteers (60 attendees) (October 24); gave an invited welcome talk at the TACF Symposium in Cromwell (60 attendees) (October 26); hosted a tour of the Lockwood Farm chestnut biocon-

trol plots and orchards as part of the TACF Symposium (40 attendees) (October 26); attended the Connecticut Urban Forest Council's meeting to plan the CUFC conference (October 30).

SARA NASON, PH.D. met virtually with colleagues and students from the University of Minnesota (Dr. Christy Haynes, Riley Lewis, and Cheng-Hsin Huang), Yale (Dr. Vasilis Vasilou), and CAES (**JASON WHITE, PH.D., Nubia Zuverza-Mena, Ph.D., Jingyi Zhou, Ph.D.**) to discuss an ongoing funded collaboration on nanomaterial enhancement of PFAS phytoremediation (October 1); met with Dr. Jorge Gardea-Torresdey from the University of Texas El Paso (October 1); as the vice chair, participated in virtual meetings for the Best Practices for Non-Targeted Analysis working group (October 3, 7, 15, 18, 30); met virtually with representative from the Best Practices for Non-Targeted Analysis working group and the Metabolomics Quality Assurance and Quality Control Consortium to discuss potential collaboration (October 7); met virtually with a student to discuss a high school science fair project (October 18); met virtually with Emily Sigman (Dartmouth), Joseph Orefice (Yale), **CHRISTIAN DIMKPA, PH.D.**, and **Jasmine Jones** to discuss a funded project measuring contaminants in maple syrup (October 21); gave a virtual guest lecture for a course at the University of Massachusetts Amherst on phyto- and bio-remediation of PFAS in soil (October 22) (24 attendees); participated in the annual management review for ISO17025:2017 accreditation of the CAES Department of Analytical Chemistry (October 24).

ITAMAR SHABTAI, PH.D. met with two students to discuss potential internship opportunities at CAES (October 2 and October 17); met with colleagues from Yale Drs. Noah Planavsky and Eric Slessarev along with **Alice Zhou, Ph.D.** to discuss an ongoing collaboration (October 3); met with colleague Dr. Mike Rowley from University of Zurich to discuss an invitation to visit and a Perspective article (October 7); held a group meeting at CAES with colleagues from Yale Drs. Eric Slessarev and Mariela Arredondo along with **Alice Zhou, Ph.D.** to discuss shared projects (October 8); served as a judge for the poster portion of the second annual Post-doctoral Symposium (October 11); met with a colleague from the University of Idaho to discuss an ongoing collaboration (October 24); attended a zoom committee meeting for a Cornell PhD candidate (October 28).

JING YUAN, PH.D. gave a presentation on "Nanopore Sequencing for Corn Rhizosphere Soil Microbiome Affected by Phosphorous Nanoparticles" at the 2nd Annual CAES Postdoc Research Symposium and won the best presentation prize (October 11); gave a poster presentation at the Sussex Symposium at Yale University (October 18).

ELISABETH WARD, PH.D. participated in the monthly Master Woodland Managers partner meeting (October 1); presented a research update at the Board of Control Fall meeting (8 participants) (October 9); presented a lecture on the climate mitigation potential of urban forests to a global audience for the Yale Urban Climate Leadership Certificate Course (21 participants) (October 10); participated in the monthly State Coordinators meeting for the Forest Ecosystem Monitoring Cooperative (October 10); presented an invited seminar on the effects of plant mycorrhizal associations on soil organic matter dynamics in forests at Western Connecticut State University (50 participants) (October 17); presented an invited talk titled "Changes in Connecticut's Forest Composition following Pest and Pathogen Invasions" at the Clinton Land Trust Annual Meeting (30 participants) (October 21); participated in the inaugural Connecticut Oak Wilt Working Group meeting along with representatives from the USDA Forest Service and the University of Connecticut (October 25); hosted the Connecticut Forest Ecosystem Monitoring Cooperative State Partnership Committee meeting to discuss research priorities with forestry stakeholders (16 participants) (October 31).

JEFFREY S. WARD, PH.D. (Emeritus) spoke on growth response of oak stump sprouts when protected from deer browse at the Massachusetts Chapter-Society of American Foresters annual meeting in Oakham (31 attendees) (October 24).

SUMMER WEIDMAN participated (virtually) in the CT DEEP Aquatic Invasive Species Task Force quarterly meeting (October 7) and the Hamburg Cove Hydrilla Management Group (October 15); gave a greenhouse tour and explained aquatic plant management to students and faculty from the Foundation High School as part of a CAES tour (October 18); chaired the CAES DEI committee meeting (October 22); attended the Northeast Arc Users Group annual conference in Burlington, VT (October 28-30).

LEIGH WHITTINGHILL, PH.D. served as a judge for the presentation portion of the second annual Post-doctoral Symposium (October 11); explained her research to students and faculty from Foundation High School as one stop on their tour of CAES (October 18); attended the CAES DEI committee meeting (October 22); met with Stephen Cremin-Endes, Director of Community Building and Organizing for Neighborhood Housing Services of New Haven to discuss collaborative research and outreach opportunities (October 29).

YINGUE (CHARLIE) YU, PH.D. attended the webinar “Colloidal Fingerprints of Food and Beverages with multidetector AF4-MALS” organized by ACS (October 23); attended the webinar “Best Practice for LDIR Analysis of Microplastics: A Case Study from the Japan Trench” provided by ACS (October 24); participated in the MONet XCT working group (October 24); participated in an online seminar “Pore-scale and Multiscale Modeling: Modern Techniques and Applications” (October 25).

ALICE ZHOU, PH.D. presented a lecture over Zoom to the Historical Geobiology course at Dartmouth College, where she reviewed Archean iron and silica cycling (October 23).

GRANTS RECEIVED:

SCOTT C. WILLIAMS, PH.D and **MEGAN A. LINSKE, PH.D** are co-principal investigators on a Centers for Disease Control and Prevention Broad Agency Announcement contract (75D301-24-R-72894) with BanfieldBio, Inc. titled “Development of a Botanical Acaricide” for topic 8b. “*Novel methods to control or prevent bites by Ixodes scapularis ticks: Novel approaches for control of host-seeking ticks.*” Total award **\$1,305,750** with **\$177,525** coming to CAES.

The overall deliverable will be a botanical acaricide in a granular formulation with up to three active ingredients that have proven efficacy against *I. scapularis* in the laboratory and the field, and that is suitable for scale-up manufacturing and testing in large-scale field experiments, compilation of data needed for pesticide registration and potential incorporation into integrated pest management programs for the management of *I. scapularis* and potentially other ticks that vector human disease pathogens.

BLAIRE STEVEN, PH.D and **ITAMAR SHABTAI, PH.D**, along with colleagues from the University of Connecticut and Connecticut DEEP received funding from the New York and Connecticut Sea Grant program Long Island Sound Research Call. The funded project is titled “Deciding when, where, and how to use and amend sediment additions to increase salt marsh resilience.” The funding is for two years with a total amount of **\$550,000** with **\$50,000** coming to CAES. The rationale statement for the successful grant is as follows:

Rationale:

Implementing restoration techniques that increase the elevation of marsh platforms, specifically adding sediment directly to marsh surfaces, can promote coastal resilience and is therefore a priority for coastal managers. Sediment added to marsh surfaces is often locally sourced

dredge that is sulfidic and can result in development of acid sulfate soils when exposed to air. The low pH of acid sulfate soils (along with associated metal toxicity or oxidized iron accumulation) inhibits plant growth, limiting capacity to meet wildlife conservation and carbon storage goals after sediment additions. Locally sourced soil amendments have the potential to reduce acidity in applied sediments, improving outcomes of coastal marsh restoration. Our overarching goals are to fully evaluate when, where, and how dredge materials and amendments should be applied to marsh surfaces along the southern New England coast, and to quantify how sediment additions influence ecosystem functions

SARA NASON, PH.D., KELSEY E. FISHER, PH.D., JASMINE JONES, and TRACY ZARILLO along with colleagues from the University of Virginia, the Mi'kmaq Environmental Laboratory, the Central Aroostook County Soil and Water Conservation District, and Upland Grassroots received funding from the EPA-G2023-STAR-J1: Research For Understanding PFAS Uptake And Bioaccumulation In Plants And Animals In Agricultural, Rural, And Tribal Communities Research Call. The funded project is titled “Novel, bio-enabled strategies to prevent per- and polyfluoroalkyl substances accumulation in crops and food webs.” The funding is for four years with a total amount of **\$1,600,000** with **\$239,953** coming to CAES.

Project summary: Contamination of farmland by PFAS poses a major challenge to both viability of farms as well as human health. Additionally, spread of PFAS from highly polluted areas can bioaccumulate in native plants of cultural significance, animals and other key parts of food webs, exposing communities to multiple sources of PFAS contamination. The objectives of this study are to (1) quantify PFAS uptake into soil and crops from contaminated irrigation water, chemicals and environmental conditions, (2) develop on-farm tools to identify unexpected PFAS sources, (3) determine how PFAS can spread to culturally important plants to tribal communities, (4) Quantify PFAS bioaccumulation in animals and insects in food webs.

In Aim 1 sentinel plants will be developed that directly detect PFAS and used to quantify PFAS bioaccumulation in potato, kale and broccoli in greenhouse studies. In Aim 2, on-farm field trials will determine how environmental conditions on PFAS accumulation, identify cultivars resistant to PFAS uptake, and identify unexpected sources of PFAS contamination. In Aim 3, field collection of insect, animal and native plant tissue samples in regions adjacent to highly polluted land will enable understanding of how PFAS bioaccumulation into food webs occur.

The outcomes of this work include recommended protocols and cultivars for growers to reduce PFAS bioaccumulation in crops, technologies for on-farm, direct detection of PFAS during the growing season and critical data to understand how tribal and rural communities are exposed to PFAS contamination through its bioaccumulation in animals, insects and native plants of cultural significance.

PUBLICATIONS:

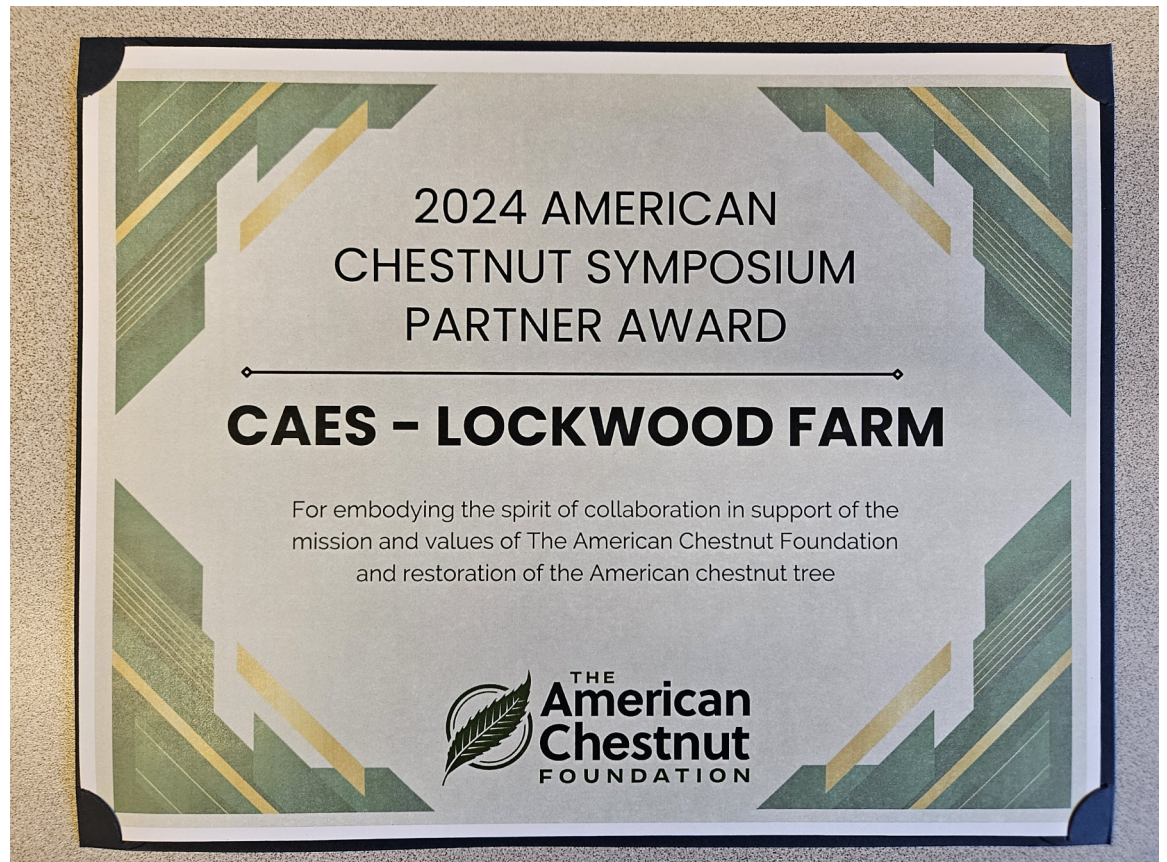
1. McAvoy, T. J., Foley, J. R., Barnett, S. D., Mays, R., Dechaine, A., & Salom, S. M. (2024). Laboratory assessment of predation and fecundity of *Laricobius* species (Coleoptera: Derodontidae), predators of hemlock woolly adelgid. *Biocontrol Science and Technology*, 1–24. DOI: [10.1080/09583157.2024.2405155](https://doi.org/10.1080/09583157.2024.2405155)

Abstract: The hemlock woolly adelgid (HWA), *Adelges tsugae* (Hemiptera: Adelgidae), is native to the Pacific Northwest and Asia and is an invasive insect in the eastern United States causing widespread decline in health and increased mortality of native eastern and Carolina

hemlock. Laboratory experiments conducted at ambient field temperatures were done to determine the adult and larval feeding totals on HWA and fecundity of the introduced predators *Laricobius nigrinus* and *L. osakensis*, and the native *L. rubidus* (Coleoptera: Derodontidae). During the 22-week period when *Laricobius* spp. adults are active in Virginia, from early November until late March the total mean ($\bar{x} \pm \text{SE}$) of HWA eggs, nymphs, and adults were projected to be consumed per *L. nigrinus* (33.8 ± 4.0), *L. osakensis* (33.2 ± 4.0), and *L. rubidus* (16.4 ± 2.5) adults. *Laricobius osakensis* (102.1 ± 13.7) and *L. nigrinus* (72.0 ± 10.5), oviposited a similar number of eggs while *L. rubidus* (24.5 ± 5.2) oviposited a lower number of eggs. Mean larval consumption of HWA progrediens eggs was: *L. nigrinus* (169.6 ± 7.1), *L. osakensis* (140.1 ± 8.7), and *L. rubidus* (135.8 ± 12.8). The mean egg production of HWA was 74.5 ± 2.2 . Based on predation and fecundity totals, *L. osakensis* was predicted to have a greater impact in reducing the number of HWA progrediens eggs than *L. nigrinus* and *L.*

AWARDS:

CAES and **LOCKWOOD FARM** received the inaugural Partner Award from The American Chestnut Foundation. The chestnut breeding program at CAES which started in the Sleeping Giant Orchards in the 1930's is the longest continuous chestnut breeding program in the United States. The awards recognize the work of organizations who embody the spirit of collaboration in support of the TACF mission to restore the American chestnut tree. **SUSANNA KERIÖ, D.SC.** accepted the award on behalf of CAES and Lockwood Farm during the TACF Symposium Award Ceremony in Cromwell on October 26.



PLANT PATHOLOGY AND ECOLOGY

LINDSAY TRIPLETT, PH.D., on behalf of lead author **Ravi Patel, Ph.D.**, presented a short talk titled “Diverse rhizosphere protists respond to auxin” at the 6th annual Sussex Symposium at Yale University (70 adults) (October 18), and served as a judge at the CAES Postdoctoral Symposium. Also at the Sussex symposium, **Mr. Cole Wilson** from the Triplett Lab presented a poster titled “Soil protists harbor diverse novel bacteria that modulate growth via auxin signaling”.

WASHINGTON DA SILVA, PH.D. gave a seminar at the Universidade Federal de Viçosa (UFV) in Brazil titled “Using RNAi Inducers and Nanotechnology to Control Plant Pathogens” (60 adults) (October 4) and participated in 2 Ph.D. committee meetings (Uday Thera from the University of Maryland on October 17, and Daniel Cerritos from the University of Connecticut on October 15). The **da Silva Lab members** (MS student, Jarlan Silva; Ph.D. students, Paula Rodrigues and Joedson Silva; and Dr. Rania Eltanbouly) participated in the Sussex Symposium held at Yale University on October 18, they presented posters.

YONGHAO LI, PH.D. gave a lecture of Tree Diseases to CTPA Arboriculture 101 students (43 adults, October 3); presented Backyard Small Fruits 101 to Haddam Garden Club members (31 adults, October 9); participated in CT Tree Wardens School course review (20 adults, October 10); along with **Felicia Millett**, talked about plant disease diagnosis and control to the Foundation High School teachers and students during the CAES tour (7 adults, October 18); Participated in CT Oak Wilt Worning Group meeting via Zoom (9 adults, October 25)

FELICIA MILLETT participated in the NPDN Professional Development Committee monthly meeting (10 adults) (Oct 10); participated in the NPDN Proficiency Committee monthly meeting (7 adults) (Oct 15); hosted a tour of the PDIO lab for the Foundation High School (5 students, 2 adults) (October 18); led a plant disease discussion at the CTPA Arboriculture 101 Tree Conditions Lab (40 adults) (Oct 24); and participated in the CT Oak Wilt Working Group Meeting (9 adults) (Oct 25).

RAVIKUMAR PATEL, PH.D. presented a poster titled “Soil protists harbor diverse novel bacteria that modulate growth via auxin signaling” at the CAES Postdoctoral Symposium (Oct. 11, 40 adults), and at the Sussex Plant Biology Symposium at Yale (Oct. 18th, 70 adults).

RAQUEL ROCHA, PH.D. served as a judge at the 2024 CAES Postdoctoral Symposium on October 11th (~50 people). She also attended the 2024 Sussex Symposium for Plant Science, held at Yale University on October 18th, 2024 (~100 people). Members of the **Rocha Lab**, including M.S. student Tobi Okunade and Ph.D. student Monique Silva, participated in both events, where they presented their research.

NEIL SCHULTES, PH.D. presented a poster entitled “Interaction of *Erwinia amylovora* amino acid auxotrophs on apple flower stigmas” at the 2024 Sussex Symposium for Plant Science in Marsh Hall at Yale University on October 18, 2024 (~100 people); attended the 86th Northeastern Tree Fruit Working Group meeting in Northampton, MA and presented a talk entitled “Amino acid requirements for *Erwinia amylovora* on the stigma” (40 adults) (October 22-23).

STEPHEN TAERUM, PH.D. presented a poster titled “Protist-mediated bacterial selection is culture specific, and partially mediated by taxonomy” at the CAES Postdoctoral Symposium (Oct. 11, 40 adults), and at the Sussex Plant Biology Symposium at Yale (Oct. 18th, 70 adults).

QUAN ZENG, PH.D. participated in the 86th Northeastern Tree Fruit Working Group meeting in Northampton, MA, and presented an invited talk “How does *Erwinia amylovora* enter

apple leaves and cause shoot blight” (40 adults) (Oct 23rd); participated in a zoom meeting with John Myron staff of Congresswoman Rosa DeLauro and Dr. Gordon N. Merrick, the Senior Policy & Programs Manager of Organic Farming Research Foundation and talked about ongoing research in apple disease management at CAES and federal research funding in supporting organic agriculture (Oct 28th). **James Standish** from Zeng Lab presented a talk entitled “Identification of genes required for pathogen entry during shoot blight infection” at the Sussex Symposium held at Yale University (50 adults), (October 18).

PUBLICATIONS:

1. **Mukhtar S, Hassani MA, Zarrillo T, Cui Z, Sundin GW, Zeng Q.** (2024). The role of foraging pollinators in assembling the flower microbiota and transmitting the fire blight pathogen *Erwinia amylovora*. *Environ Microbiol.* Oct;26(10):e16702. DOI: [10.1111/1462-2920.16702](https://doi.org/10.1111/1462-2920.16702) . PMID: 39389580.

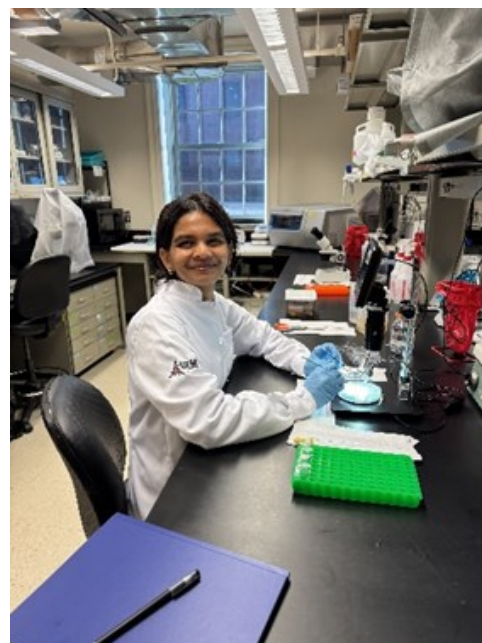
Abstract: Flowers serve as hubs for biotic interactions with pollinators and microbes, which can significantly impact plant reproduction and health. Previous studies have shown that the flower microbiota undergoes dynamic assembly processes during anthesis. However, the influence of foraging pollinators on the assembly and dispersal of the flower microbiota and the transmission of plant pathogens remains poorly understood. In this study, we used insect exclusion netting to investigate the role of pollinators in the assembly of the microbiota on apple stigma and the transmission of the fire blight pathogen *Erwinia amylovora*. We found that excluding pollinators had a minor impact on the community diversity and composition of the apple stigma microbiota, while the flower's developmental stage had a strong influence. Additionally, pollinator exclusion altered bacterial dispersal and the relative abundance of different bacterial species, including *E. amylovora*, suggesting that pollinators play a role in transmitting plant pathogens. Using a reporter system, we demonstrated that bumble bees can transmit the fire blight pathogen from an infected flower under controlled growth conditions. Our study highlights the importance of intrinsic and pollinator-independent microbes as sources of inoculum for the stigma microbiota and underscores the role of foraging pollinators in vectoring plant pathogens.

NEW STUDENTS, STAFF, AND VOLUNTEERS:



Paula Rodrigues, a Ph.D. student from the Universidade Estadual de Maringá (UEM), Maringa – PR, Brazil, will spend six months at the **da Silva Lab** to work on her Ph.D. project, “**Phenotypic characterization and molecular resistance of isolates of *Bipolaris sorokiniana* to DMI fungicides**”. She will sequence the genomes of isolates of *B. sorokiniana* sensitive and resistant to the fungicide cyproconazole and perform genome annotations to locate the Cyp51 gene. Paula will also grow fungal cultures *in vitro* for gene expression analysis. Paula received a prestigious scholarship from the Brazilian Federal Agency for Research and Education (CAPES) to fully cover her stay at CAES.

The **Rocha Lab** is excited to welcome **Ravali Krishna**, who will volunteer at CAES for three months. Krishna's project will focus on identifying bacterial strains with potential biocontrol activity against root-knot nematodes.



JOURNAL ARTICLES APPROVED OCTOBER 2024

Deng, P.; Gao, Y.; Mub, L.; **White, J. C.**; Hua, X.; Yu, F.; Kia, Y.; Wang, Z.; Zing, B. Development potential of nanoenabled agriculture projected using machine learning. *Proceedings of the National Academies of Science (PNAS)*.

Doroski, D. A., **Kerio, S. E.**, Wegrzyn, J. L., **Ward, E. B.** Acer platanoises L. Norway Maple (Book chapter). *Silvics of North America Volume 2. Hardwoods*.

Garcia, A.; Kewir, F.; Wang, Y.; Astete, C.; **White, J. C.**; Sabliov, C. Hydrophobic CuS nanoparticle entrapment and release from lignin-derived nanoparticles. *Journal of Nanoparticle Research*.

Harp1, R. D., Holcomb, K. M., Retkute, R., Prusokiene, A., Prusokas, A., Ertem, Z., Ajelli, M., Kummer, A. G., Litvinova, M., Merler, S., Pastore y Piontti, A., Poletti, P., Vespignani, A., Wilke, A. B. B., Zardini, A., Smith, K. H., **Armstrong, P.**, DeFelice, N., Keyel, A., **Shepard, J.**, Smith, R., Tyre, A., Humphries, J., Cohnstaedt, L., Hosseini, S., Scoglio, C., Gorris, M., Barnard, M., Moser, S. K., Spencer, J., McCarter, M. S. J., Lee, C., Nolan, M. S., Staples, E., Nett, R., and Johansson, M. Evaluation of the 2022 West Nile Virus Forecasting Challenge, United States. *Parasites & Vectors*.

Hyde, K. D., **Li, D. W.** et al. The 2024 Outline of Fungi and fungus-like taxa. *Mycosphere*.

McAvoy, T. J., Saint-Amant, R., **Foley IV, J. R.**, Jubb, C. S., Mays, R., Salom, S. M. Laricobius Species (Coleoptera: Derodontidae) Larval Predation and Sampling, Predators of Hemlock Woolly Adelgid. *Biological Control Science and Technology*.

Smith, J. L., Farhan, Y., **Fisher, K. E.**, Wells, J., Congdon, C., Saguez, J., Byker, H., and Dively, G. Sentinel monitoring detects resistance to Bt toxins in European corn borer *Ostrinia nubilalis* Hubner (Lepidoptera: Crambidae) in Eastern North America. *Journal of Economic Entomology*.



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Station News was prepared and edited by Dr. Jason White, Ms. Vickie Bomba-Lewandoski, and Mrs. Natalie Rivera.



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