Research for Credit Internship Projects at the CT Agricultural Experiment Station
Fall 2024, Spring-Summer 2025

Department of Plant Pathology and Ecology

"Plant Vaccines" with Dr. Quan Zeng (quan.zeng@ct.gov). This project will investigate how some minor pathogens can induce immunity to suppress infection of a more serious pathogen.

"Hunting for Healthy Soil" with Dr. Lindsay Triplett (lindsay.triplett@ct.gov). We are determining how microscopic protist predators interact with bacteria to help crops grow. We have several projects available based on your interest in microscopy, molecular biology, genomics, or classical microbiology.

"Managing harmful interactions between soilborne pathogens and plants" with Dr. Raquel Rocha (raquel.rocha@ct.gov). This opportunity involves using microbiology, nematology, and molecular techniques to develop sustainable strategies against plant pathogenic fungi and parasitic nematodes. Projects in this lab include screening biocontrol bacteria for their effectiveness against Fusarium wilt and root-knot nematodes, as well as identifying the biochemical and cellular processes necessary for root-knot development and nematode nutrient acquisition in plants. This work takes place in a dynamic environment that will inspire professional growth and learning, with potential for paid opportunities.

"Population Genetics and Biology of the Beech Leaf Disease Nematode" with Dr. Robert Marra (robert.marra@ct.gov). We are using DNA fingerprinting to compare populations of the North American subspecies with populations of the closely related Japanese subspecies. Join us in this project and learn to isolate nematodes from leaves and buds, extract their DNA, and analyze the DNA using PCR and sequencing.

"Fire Blight Disease in Apples" with Dr. Neil Schultes (neil.schultes@ct.gov). This project investigates how host nutrients play a role in infection by the bacterium *Erwinia amylovora*, the causal agent of fire blight on apples.

Department of Entomology

"Mosquito Population Genetics" with Dr. Andrea Gloria-Soria. Learn to extract DNA and genotype mosquitos to investigate the connectivity of local populations and how it may influence human disease transmission.

"Examining Barriers to Virus Infection of Mosquito Ovaries" with Dr. Doug Brackney (douglas.brackney@ct.gov). Female mosquitoes are well known for their ability to transmit viruses to humans through their bite; however, much less is known about their ability to transmit viruses to their offspring. We will be examining the conditions mediating virus infection of ovaries.

"Southern Pine Beetle Moves North" with Dr. Claire Rutledge (claire.rutledge@ct.gov). Climate change is allowing insects to expand their range northward. Learn about invasive species and their impact on local ecosystems. Expect to sort trap samples, learn tree species, perform tree surveys and dissect logs to identify overwintering stages of the beetles.

"Agricultural Insect Movement and Habitat Suitability" with Dr. Kelsey E. Fisher (kelsey.fisher@ct.gov). In this agricultural entomology lab, several projects are underway to investigate movement and habitat suitability for beneficial (monarch butterflies and bumblebees) and pest species (spotted lanternfly & European corn borer). Potential work includes DNA extraction; spatial analyses and GIS mapping; insect rearing; insect collection, preservation, and identification.

"Mosquito- and Tick-Host Interactions and Transmission of Vector-Borne Diseases" with Dr. Goudarz Molaei (goudarz.molaei@ct.gov). In this medical entomology laboratory, students can learn about host selection in mosquitoes and its importance for pathogen transmission. The learning objectives will include, but are not limited to, examining the relationship between microbial pathogens, arthropod vectors, and mammalian and avian hosts by learning morphological identification of mosquitoes and ticks using morphological keys, dissection, nucleic acid extraction, PCR, sequence analysis, etc.

"Active and Passive Tick and Tick-borne Disease Surveillance Programs" with Dr. Megan Linske (megan.linske@ct.gov) and Dr. Goudarz Molaei (goudarz.molaei@ct.gov). In these two medical entomology programs, students will have the opportunity to participate and learn about tick biology, ecology, phenology, host choice, and interactions among various tick species in the field, as well as their roles in pathogen transmission in laboratory studies. The learning objectives will include, but are not limited to, better understanding the biology and ecology of tick vectors of human diseases and tick surveillance by learning surveillance methods, molecular biology techniques (e.g., nucleic acid extraction, PCR, gel electrophoresis, etc.), and data analysis.

"Subspecies reproduction of the common bed bug, *Cimex lectularius*" with Dr. Gale E. Ridge (gale.ridge@ct.gov) and Katherine Dugas (Katherine.dugas@ct.gov). Human feeding bed bugs promote visceral psychological distress when discovered. This leads to over reaction resulting in lives being deeply affected and disrupted often for extended periods of time. With the advent of considerable international trade and shipping starting in the late 1990's, bed bugs were rapidly reintroduced to the United States from numerous countries worldwide. An initial study found that particular subspecies of human bed bugs when crossed with other populations became more fertile. This is called "Hybrid Vigor." The study would cross several bed bug lines to observe fertility levels against pure-line controls.

"Delusional Infestation (DI). A comparative study looking at how DI is managed in different cultures and medical systems worldwide" with Dr. Gale E. Ridge (gale.ridge@ct.gov) and Katherine Dugas (Katherine.dugas@ct.gov). DI is an unshakable belief system that has evolved over time by patients who have self-diagnosed themselves with parasitic worms, insects, or mites etc. Most experience a somatic dermal or enteric discomfort which is not diagnosed and so they fill in the gap of information with what they think is parasitism. Through repeated "doctor hopping," sunk cost fallacy and confirmation bias a protective belief system evolves resulting is loss of care, isolation and sometimes years of suffering. This is a bifurcated psychological and somatic disorder. Depending on which medical systems patient are in, outcomes can be very different. This would be a survey of how different medical systems worldwide diagnose and treat these complex cases.

Department of Forestry and Environmental Science

"**Soil Biogeochemistry**" with Dr. Itamar Shabtai (itamar.shabtai@ct.gov). Use spectroscopy and stable isotope tracing to study the cycling of carbon and nutrients in the soil and learn how it is impacted by soil properties and management. Students can participate in projects that investigate the impact of plant roots on different aspects of soil chemistry and projects related to soil amendments that promote carbon sequestration.

"Environmental Microbiomes" with Dr. Blaire Steven (blaire.steven@ct.gov). Use genomics and microbiology to understand the contribution of microorganisms to organism and environmental health.

"Urban Agriculture" with Dr. Leigh Whittinghill (leigh.whittinghill@ct.gov). This research program looks at maximizing production capacity in urban agriculture using container production systems and repeat harvesting techniques. Learn about greens and cucumber production and laboratory analysis techniques for determining the nutrient content in runoff water and plant tissues.

"**Stress Indicators for Urban Maples**" with Dr. Susanna Keriö (susanna.kerio@ct.gov). The project studies the application of non-structural carbohydrates as a stress indicator for urban maples. The student would learn tree phenotyping methods through field work, tree physiological measurements, and analysis of carbohydrate samples using spectroscopic methods.

"**Urban Trees and Mycorrhizae**" with Dr. Susanna Keriö (susanna.kerio@ct.gov). The project studies the impact of mycorrhizal inoculation on the health of newly planted urban trees. The student would learn tree phenotyping methods, inoculate trees with mycorrhizae, learn microscopy techniques, and nucleic acid extractions. Possibility to be hired as a research assistant.

"**Bark Assays to Quantify Resistance to Chestnut Blight"** with Dr. Susanna Keriö (susanna.kerio@ct.gov). The project studies the inhibitory properties of chestnut bark extracts to a fungus causing chestnut blight. The student would learn tree phenotyping methods through field work, preparation of bark extracts, and conduct agar plate assays.

"Quantifying the Distribution, Abundance, Mode of Spread, and Herbivore Pressure of Invasive Aquatic Weeds" with Dr. Jeremiah R. Foley, IV (jeremiah.foley@ct.gov). The primary objective of the Office of Aquatic Invasive Species (OAIS) revolves around addressing the ecological disturbances resulting from invasive aquatic plants and exploring the various strategies for their control and management. There are several projects underway to investigate the distribution, mode of spread, and herbivore assemblage of several invasive aquatic species (i.e., *hydrilla*, water chestnut, *cabomba*). Each project includes a lab, greenhouse, and field component. Potential work includes insect collection; insect rearing; insect identification; aquatic plant culturing, plant identification.

"Organic Chemicals as Environmental Contaminants" with Dr. Sara Nason (sara.nason@ct.gov). This project involves learning to measure environmental contaminants such as pharmaceuticals and PFAS (per- and polyfluoroalkyl substances) in soil, plants, and water.

Department of Analytical Chemistry

"Nutrient Quality Control of Agriculture Plants" with Dr. Yi Wang (yi.wang@ct.gov). Learn to synthesize agro-nanomaterials evaluate nutrient quality in agriculture plants and examine the potential presence of contaminants.

"**Wildfire Impact on Plants Metabolism**" with Dr. Nassifatou Koko Tittikpina (nassifatou.tittikpina@ct.gov). Using a combination of agricultural and chemical sciences, learn how plants are impacted at the biochemical levels by wildfire deposits and the potential consequences for agriculture and human healthcare.

Valley Laboratory (Windsor, CT)

"Fungi and Fruit" with Dr. Nate Westrick (nathaniel.westrick@ct.gov). Combine molecular biology and greenhouse studies to understand how fungal pathogens infect different fruit crops. This project could include genetic manipulation of fungi using CRISP-Cas9, basic molecular techniques, outdoor field studies, or more depending on the interest of the applicant. Primary work will be conducted at the Valley Laboratory in Windsor, CT (north of Hartford).