

# SOIL SCIENCE, DOCTORAL MINOR

## PEOPLE

### PEOPLE FACULTY

Dr. Francisco Arriaga

Applied Soil Physics, Soil and Water Management and Conservation: Conservation agriculture systems; development of conservation tillage practices that enhance soil quality, soil hydraulic properties, and plant water use through the adoption of cover crops and non-inversion tillage for traditional cropping systems.

Dr. Nicholas Balster

Soil Ecology, Plant Physiological Ecology, and Education: Energy and material cycling in natural and anthropogenic soils including forests, grasslands, and urban ecosystems; stable isotope ecology; environmental education; nutrition management of nursery soils; tree physiology, production and response; ecosystem response to global change; urban ecosystem processes; invasive plant ecology; biodiversity.

Dr. Phillip Barak

Soil Chemistry and Plant Nutrition: Nutrient cycling; nutrient recovery from wastewater; molecular visualization of soil minerals and molecules; soil acidification.

Dr. Zachary Freedman

Soil microbiology, ecology and sustainability: Effects of environmental change on biogeochemical cycles; community ecology and trophic dynamics; forest soil ecology; soil organic matter dynamics; sustainable agroecosystems; bio-based product crop production on marginal lands.

Dr. Alfred Hartemink

Pedology, Digital Soil Mapping: Pedology; soil carbon; digital soil mapping; tropical soils; history and philosophy of soil science.

Dr. Jingyi Huang

Soil Physics, Proximal and Remote Sensing, Soil Monitoring and Management, Digital Soil Mapping: Application of proximal and remote sensing technologies for understanding the movement of water, heat, gas, and solutes in soils across different spatial and temporal scales; application of physical and empirical models for monitoring, mapping, and managing soil changes due to natural processes and human activities.

Dr. Inna Popova

Environmental soil chemistry; understanding and mitigating the response of soil systems to the increased pressure of organic contaminants; application of biopesticides; development of novel

separation and analyses methods for contaminants in environmental matrices.

Dr. Natasha Rayne

Soil Fertility and Nutrient Management: Manure placement, timing, and nitrogen credits; Organic soil amendments and nutrient cycling; Climate-smart and site-specific nitrogen management; Improvement of nitrogen use efficiency in cereal crop production.

Dr. Matthew Ruark

Soil Fertility and Nutrient Management: Soil fertility and management of grain biofuel, and vegetable crops; cover crop management; agricultural production and water quality; sustainability of dairy cropping systems; soil organic matter management.

Dr. Douglas Soldat

Turfgrass and Urban Soils–Turfgrass, urban soils, nutrient management, water resources, soil testing, landscape irrigation; soil contamination.

Dr. Thea Whitman

Soil Ecology, Microbiology, and Biogeochemistry: Soil microbial ecology; organic matter decomposition and carbon stabilization; global environmental change; stable isotopes; linking functional significance of microbial communities with ecosystem processes; fire effects on soil carbon and microbes; management and policy.

Dr. Xia Zhu-Barker

Soil Biogeochemistry, Land Management, and Environmental Sustainability: Nitrogen and carbon biogeochemical cycles; greenhouse gas and air pollutant emissions; nitrate leaching and runoff; innovative manure and nutrient utilization; composting; climate change mitigation and adaptation; ecosystem services and carbon markets; dairy environmental sustainability; novel methods in isotopic techniques; mechanistic exploration of soil-plant-microbe interactions; process-based modelling. The specific research topics include:

- Microbial and abiotic processes involved in the production and consumption of nitrogen and carbon gases ( $N_2O$ ,  $NO_x$ ,  $NH_3$ ,  $CO_2$ ,  $CH_4$ )
- Land management practices (e.g., compost, fertilizer, cover crops, irrigation, and tillage) that change soil health, nitrogen use efficiency, crop productivity, nitrogen losses, carbon turnover.
- Process oriented modelling of carbon/nitrogen turnover in agricultural ecosystems.
- Environmental changes on the sustainability and resilience of agricultural ecosystems especially dairy production systems.