THE UNIVERSITY OF TENNESSEE KNOXVILLE

The **Shao EcoLab** (PI: Dr. Siya Shao) in the **Department of Microbiology at the University of Tennessee, Knoxville** is recruiting up to **two highly motivated PhD students for Fall 2027** through UTK graduate programs. Our lab examines how soil microorganisms interact with plants and minerals to regulate ecosystem carbon and nutrient cycling, and how explicitly representing these interactions can improve ecosystem predictions. We combine process-based ecosystem models with field and laboratory data to understand how natural and agricultural ecosystems respond to global change, while exploring integration with machine learning and AI. Please see our website (https://shao-ecolab.github.io/) for more information.

The student will develop an independent research direction within or across the themes below. Students with interests in the following topics and strong quantitative skills are encouraged to apply:

1. **Plant–microbe interactions and ecosystem biogeochemistry:** Investigate how interactions among plants, mycorrhizal fungi, and other rhizosphere microbes shape carbon and nutrient cycling. Combine ecosystem models with field and laboratory data to understand how natural and agricultural ecosystems respond to global change.
2. **The role of minerals in ecosystem management and climate solutions:** Examine how mineral weathering and plant–microbe–mineral interactions influence nutrient availability and organic and inorganic carbon cycling. Explore how these processes can inform ecosystem management and carbon removal strategies.
3. **Next-generation ecosystem models:** Explore approaches to representing plant and microbial traits informed by omics data, and to explicitly including soil food webs, including soil animals, in ecosystem models. Investigate how machine learning and AI can support rapid model development and evaluation.

Preferred candidate expertise: backgrounds in microbiology, ecology, soil or environmental science, geography, computer science, applied mathematics or related fields are welcome. Preferred qualifications include:

- Research experience in the field, in the laboratory or with data.
- Experience with Python, R, Fortran or another programming language, or a strong interest in learning; prior modeling experience is not required.
- Research initiative, intellectual curiosity, and strong written and oral communication skills.

Formal applications: apply to the **Department of Microbiology PhD program** (https://micro.utk.edu/graduate/; complete applications by **December 1, 2026**) or to the **Bredesen Center** PhD programs in Data Science and Engineering (DSE), Genome Science and Technology (GST), or Energy Science and Engineering (ESE) (https://bredesencenter.utk.edu/phd-programs/; final deadline **December 1, 2026**). Microbiology and GST place students through first-year rotations; DSE and ESE typically match supervisors at admission, so name Dr. Shao in your application. All four programs confirm supervisors by the end of the first spring semester.

Funding: all admitted students receive full funding (stipend, tuition waiver and health insurance) for a five-year PhD. In the Department of Microbiology, students typically hold teaching assistantships for two years; in the Bredesen Center programs, the Center funds the first year and a competitive teaching assistantship typically covers a second. In both routes the lab provides three years of research assistantship support.

Initial inquiry: interested students are strongly encouraged to contact Dr. Siya Shao before applying, to discuss fit and the most suitable route. Please email sshao3@utk.edu with the subject line "Prospective graduate student" and a brief statement of your research interests and fit for the lab (including the program you are considering: Microbiology or a Bredesen Center program), your CV, and transcripts.

UT Knoxville, Tennessee's flagship university and an R1 research institution, is located in a mid-sized city on the Tennessee River, with a low cost of living and year-round outdoor recreation near **Great Smoky Mountains National Park**. Students may also have opportunities to collaborate with researchers at **Lawrence Berkeley National Laboratory**, **Oak Ridge National Laboratory**, and the **University of Arizona's Biosphere 2** through Dr. Shao's ongoing research collaborations.