

PhD student announcement: antibiotic resistance in agricultural systems

Topic: Identify the chemical drivers triggering antibiotic resistance in agricultural soils using high resolution mass spectrometry and advanced data analytics.

Dr. Gerrad Jones is an assistant professor at Oregon State University in the Department of Biological and Ecological Engineering. Dr. Tala Navab-Daneshmand is an assistant professor at Oregon State University in the School of Chemical, Biological, and Environmental Engineering. We are looking for a creative and highly motivated Ph.D. student to start in the Fall of 2019. Interested students should send a brief cover letter stating your research interests and a summary of your technical experience, a C.V. with names and contact information of at least two references, and a writing sample.

Antimicrobial resistance in the environment occurs through various mechanisms but is often linked to overexposure to antibiotics in municipal wastewater systems. Thousands of compounds are present within the environment, but most antimicrobial-resistance studies focus on ~20 antibiotics. As a result, most studies exclude > 99.9% of all chemical data in the environment but still draw conclusions that drive agricultural and food management practices. In best-case scenarios, these conclusions are highly biased toward specific conditions. In worst-case scenarios, these conclusions are erroneous and could risk human health. In this project, the chosen student will use high resolution mass spectrometry and advanced analytics to quantify how chemical mixtures trigger antibiotic resistance in agricultural systems. This information will be used to help manage agricultural systems to minimize the incidence of antibiotic resistance.

This project will consist of approximately equal proportions of field work, lab work, and computational analyses. The chosen student will use cutting edge molecular techniques to characterize and quantify target antibiotic-resistant genes and will acquire general laboratory skills and instrument analysis skills. By the end of the project, the student will have gained considerable experience in data analysis, especially with various machine learning tools.

Required Qualifications:

- Students must be creative, excited, and willing to fail. Research is ~80% problem solving, and most ideas don't work as originally planned. However, with creative out-of-the-box thinking, any problem can be overcome. Therefore, it is necessary for students to take ownership of their project and take the path less traveled to find creative solutions to move forward.

Preferred Qualifications include any combination of the following:

- MS in science, technology, engineering, or math (although accomplished BS students with technical skills will be competitive).
- Experience with programming (Python, R, or other programming language).

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- Comfortable with statistical (good) or machine learning/advanced statistical analysis (better).
- Experience with mass spectrometry instruments.
- Field work experience.
- Experience troubleshooting projects.

This line of research is challenging, and as a result, there is a lot of progress that can be made by creative individuals who are willing to work hard and can find unorthodox solutions to problems. Therefore, ***all highly motivated students, regardless of national origin, age, gender, sexual orientation, or creed are encouraged to apply.*** For more information, please contact both Dr. Jones and Dr. Navab-Daneshmand directly (Gerrad.Jones@oregonstate.edu, Tala.Navab@oregonstate.edu), and for more information on their research interests, please visit <http://agsci-labs.oregonstate.edu/ecochem/> and <http://research.engr.oregonstate.edu/navab/>. Applications to OSU's graduate program should be submitted by January 4, 2019.

Useful links

<https://bee.oregonstate.edu/>

BEE Department site

<https://cbee.oregonstate.edu/>

CBEE Department site

<https://oregonstate.edu/gradwater/>

Water Res. Grad. Program site

<http://gradschool.oregonstate.edu/>

OSU's graduate school

<http://www.looscomputing.ch/eng/enviMass/overview.htm>

Information on analytical software