From:	Smith, Randy
To:	Basta, Nicholas; Malone, Kelly
Cc:	Sutherland, Sue; Reed, Katie; Smith, Randy; Griffiths, Rob; Miriti, Maria; Greenbaum, Rob; Stromberger, Mary; Hunt, Ryan; Duffy, Lisa
Subject:	Proposal to establish a Microbiome Sciences Specialization
Date:	Friday, April 4, 2025 8:07:14 AM
Attachments:	image001.png

Nick and Kelly,

The proposal from the Environmental Sciences Graduate Program to establish a Microbiome Sciences Specialization was approved by the Council on Academic Affairs at its meeting on April 2, 2025. Thank you for attending the meeting to respond to questions/comments.

No additional level of internal review/approval is necessary. This action will be included in the Council's next Annual Activities Report to the University Senate (July 2025).

The Office of the University Registrar will work you with any implementation issues.

Please keep a copy of this message for your file on the proposal and I will do the same for the file in the Office of Academic Affairs.

If you have any questions please contact the Chair of the Council, Professor Sue Sutherland (.43), or me.

Randy

THE OHIO STATE UNIVERSITY

W. Randy Smith, Ph.D.
Vice Provost for Academic Programs
Office of Academic Affairs
University Square South, 15 E. 15th Avenue, Columbus, OH 43201
614-292-5881 Office
smith.70@osu.edu
Assisted by:
Katie Reed
Executive Assistant
(614) 292-5672

TO: Randy Smith, Vice Provost for Academic Programs

FROM: Graduate School Curriculum Services

DATE: **3/19/2025**

RE: Proposal to **Establish a Microbiome Science Specialization** in **Interdisciplinary Environmental Sciences Graduate Program.**

The **Interdisciplinary Environmental Sciences Graduate Program** in the **Graduate School** is proposing to **Establish a Microbiome Science Specialization.**

The proposal was received by the Graduate School on **11/12/2024**. The combined GS/CAA subcommittee first reviewed the proposal on **11/21/2024** and requested revisions. Revisions were received on **1/24/2025**. GS/CAA conducted a second review of the proposal on **2/13/2025** and requested additional revisions. The additional revisions were received **3/17/2025.** The proposal is recommended for review at CAA.

THE OHIO STATE UNIVERSITY

Environmental Sciences Graduate Program

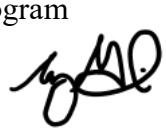
3138A Smith Laboratory
174 W. Eighteenth Avenue
Columbus, OH 43210

esgp.osu.edu

Date: January 28, 2025

To: Randy Smith, Vice Provost for Academic Programs

From: Mary Gardiner, Distinguished Professor of Food, Agriculture and Environmental Science and Co-Director and Graduate Studies Chair of Environmental Studies Graduate Program



Subject: Microbiome Specialization

Dear V.P. Smith

The Environmental Sciences Graduate Program (ESGP) Graduate Studies Committee is in support of the new Microbiome Specialization developed by ESGP co-Director Nick Basta and ESGP faculty member Matt Sullivan. This area of research has grown tremendously in recent years and is a highly relevant to many students within our program. In fact, this specialization aligns with the research programs of many of our affiliated faculty who are part of the newly formed OSU Center of Microbiome Science (CoMS). Further, we see this specialization as key in increasing student engagement beyond CoMS, particularly within College of Arts and Sciences.

Our GSC has reviewed the curriculum plan for the specialization. We find it will provide students with a sound understanding of this exciting field without being too onerous for them to take on. The approach taken here differs markedly from past specializations that were too course heavy and thus are underutilized. We feel this will be a popular choice for our students.

Thank you for considering this proposal!

Proposed Microbiome Science Specialization

Environmental Sciences Graduate Program

Mar 14, 2025

Executive Summary

We are proposing the creation of a Microbiomes Science specialization track in the Environmental Science Graduate Program (ESGP). This novel curriculum will provide graduate student training in Microbiome Science applied to Interdisciplinary Environmental Science Topics. Graduates from the ESGP-Microbiome Science program will have many career opportunities in this expanding field and help meet workplace demand. The Microbiome specialization requires two foundational courses, Environmental Microbiology and Microbiome Informatics, and two additional courses selected from controlled electives listed in the specialization track. The specialization will require 9 to 12 credit hours in addition to the ESGP core. The ESGP core curriculum requires 21 to 24 credit hours of course work. The novel Microbiome specialization will provide ESGP graduate students advanced training and education in Microbiome Science. We propose to provide interdisciplinary academic training for this next generation of Environmental Microbiome scientists, educators and other professionals which are in high demand in the current market. Training Environmental Microbiome scientists is a priority workplace development goal to meet market demands.

1. Rationale

Microbiome science is a field of discovery that has that has grown tremendously in the last two decades. Microbiome interdisciplinary research in agriculture, environmental science, food science, and one health science has increased exponentially (Olmo et al., 2022). Environmental Microbiome Science is an interdisciplinary field of study to "*Understand the assembly, function, and behavior of microbiomes and manipulate them to facilitate microbial solutions to challenging environmental problems and advance their utility across the bioeconomy"* *https://www.genomicscience.energy.gov/environmental-microbiome-research/*.

Recently, the National Academy of Sciences, Engineering, and Medicine has outlined research needs in their consensus report "exploring linkages between soil health and human health" (NASEM, 2024). This publication and others clearly outline the importance of environmental microbiome science to human health. "Scientists and educators now view Environmental Microbiome Science as a flourishing discipline, creating degree programs and departments that are conducive to cohesive growth" (Ginnan and Borderstein, 2023). We propose to provide interdisciplinary academic training for this next generation of Environmental Microbiome scientists, educators and other professionals which are in high demand in the current market. Graduates from the ESGP-Microbiome Science program will have many career opportunities in this expanding field and help meet workplace demand. We anticipate 5 to 10 students per year will be enrolled in specialization and that number will grow with time as the number of Microbiome Institute faculty participating in ESGP grows.

2. Proposed Curriculum for the Microbiome Specialization

We propose a 2 + 2 structure whereby 2 foundational courses would be required and the remaining two courses would be selected from controlled electives listed in the specialization track (Table 1). The required foundational courses are Environmental Microbiology (MICROBIO 5155) and Microbiome Informatics (MICROBIO 8161). The remaining two courses would be selected from a list of specialization options (see Table 1). This course allows trainees to enter anywhere from beginners to advanced microbiome science researchers. All students gain exposure to diverse microbiomes conceptually (in Environmental Microbiology) and get hands-on experience working with genome-

resolved multi-omics datasets (in Microbiome Informatics). From that foundation, students would select 2 additional courses that allow them to explore microbiome interests that are more specialized depending upon their background and interests.

Table 1. Controlled Electives of the Microbiome Science Specialization

Foundation courses (2)		Credit hr	Semester offered
MICROBIO 5155	Environmental Microbiology	3	autumn
MICROBIO 8161	Microbiome informatics	3	autumn
Controlled electives (2)			
ANIMSCI 5090	Gut microbiology	2	spring
BSGP 7030	Introduction to Data Science in Biomedical Science Research	2	summer
EEOB 5510	Interdisciplinary Team Science	3	autumn
HCS 7600	Metabolomics, Principles and Practice	3	spring
MICROBIO 5161	Bioinformatics and molecular microbiology	3	spring
MICROBIO 6155	Topics in Microbiome Science	3	spring
MICROBIO 5270/PHR 5270	Antibiotics and Microbial Natural Products	3	spring
MOLGEN 5650	Analysis and Interpretation of Biological Data	3	autumn
PLNTPTH 5005	Beneficial plant-associated microbiomes and plant pathology research	2	spring
PLNTPTH 5003	Principles of Molecular Plant-Microbe Interactions	2	spring

PLNTPTH 5004	Current Topics Molecular Plant Microbe Interactions	2	spring
PLNTPTH 5006	Practical Computing Skills for Omics Data	3	spring
PUBHBIO 6210	Design and Analysis if Studies in Health Science I	3	autumn
PUBHBIO 6211	Design and Analysis if Studies in Health Science II	3	autumn
PUBHEHS 7375	Quantitative Microbial Risk Analysis Modeling	3	spring
STAT 8810	Advanced Topics in Statistics I:Statistical Inference in Network Data	1	spring
VETPREV 7719 / M7719	Microbiome in Health and Disease	3	autumn

- Total number of credit hours for program completion

The specialization will require 9 to 12 credit hours in addition to the ESGP core. The ESGP core curriculum requires 21 to 24 credit hours of course work. Foundation courses of the Microbiome Specialization (MICROBIO 5155 and MICROBIO 8161) are 3 credit hr each. Two additional courses, ranging from 1 to 3 credit hours each, are selected from the controlled electives list. Please see General Curriculum vs. Microbiome Specialization Curriculum comparison for PhD and MS programs. The Microbiome Specialization could increase time to complete the program from 1 to 2 semesters.

3. Course Learning Outcomes and evaluation

Two learning outcomes of the Microbiome specialization are

- Students will demonstrate an understanding of Environmental Microbiology
- Students will demonstrate an understanding of Microbiome informatics

The key goal that is central to our student success is developing the ability to conduct novel, independent, interdisciplinary research that advances knowledge in the field. This includes mastering the essential literature, methods, as well as developing critical analysis skills necessary to evaluate data. This goal would be measured by evaluation of the master's thesis or doctoral dissertation by the student's advisors and committee. In addition to the learning outcomes of the ESGP core, students would have to demonstrate their mastery of the above two microbiome specialization outcomes. Those outcomes will be measured by evaluation of the master's thesis or doctoral dissertation by the student's advisors and committee. The instrument to access learning outcomes follows

MS and PhD Program Thesis/Dissertation for Microbiome Specialization: Assessment Rubric

Please complete this form and submit it to Graduate Program Manager Kelly Malone.

In the rubric below, indicate the ability of the student to:

Rubric Component	Exceeds Expectations	Meets Expectations	Does not Meet Expectations
Demonstrates strong knowledge base in ESGP foundational knowledge areas and specializations (if applicable)			
Summarize the essential literature in a self-selected area of specialization			
Apply critical analysis skills necessary to evaluate data			
Build off previous research and literature to develop novel research objectives and hypotheses			
Execute the techniques needed to complete their research			
Clearly describe their findings and relationship to prior studies			
Justify the need for an interdisciplinary approach to their research [evaluation can focus on interdisciplinary project chapter or full dissertation]			
Identify next steps to build off their research project			

Clarify how their work will (immediately or over a longer timeframe) advance environmental science as a field and improve environmental quality			
Demonstrate an understanding of Environmental Microbiology			
Demonstrate an understanding of Microbiome informatics			

Literature Cited

Ginnan N, Bordenstein SR. 2023. It is time to authenticate the Microbiome Sciences with accredited educational programs and departments. PLoS Biol 21(12): e3002420. https://doi.org/10.1371/journal.pbio.3002420

National Academies of Sciences, Engineering, and Medicine (NASEM) 2024. Exploring Linkages Between Soil Health and Human Health. Washington, DC: The National Academies Press. https://doi.org/10.17226/27459.

Olmo, R., Wetzels, S.U., Berg, G., Cocolin, L., Hartmann, M., Hugas, M. et al. (2023) Food systems microbiome- related educational needs. Microbial Biotechnology, 16, 1412–1422. https://doi. org/10.1111/1751-7915.14263

ESGP MS General Curriculum

ENV SCI 7899 ESGP Seminar (1 crhr)

ENV SCI 7899 ESGP Seminar (1 crhr)

ENV SCI 7899 ESGP Seminar (1 crhr)

ENV SCI 5170 Sustainability and Pollution Prevention Practices (3 crhrs)

Biological Sciences Foundational Knowledge Course (3 crhrs) (choose from approved courses on ESGP website)

Physical Sciences Foundational Knowledge Course (3 crhrs) (choose from approved courses on ESGP website)

Social Sciences/Policy Foundational Knowledge Course (3 crhrs) (choose from approved courses on ESGP website)

Entomology 7920 Presentation Skills for Interdisciplinary Scientists (2 crhrs)

Data Analysis Methods (3 crhrs) (choose from approved courses on ESGP website)

Remaining credits are a combination of research hours in your advisor's home department and elective courses planned between you and your advisor. 30 credit hours required for the MS

ESGP MS Microbiome Specialization Curriculum

ENV SCI 7899 ESGP Seminar (1 crhr)

ENV SCI 7899 ESGP Seminar (1 crhr)

ENV SCI 7899 ESGP Seminar (1 crhr)

ENV SCI 5170 Sustainability and Pollution Prevention Practices (3 crhrs)

Biological Sciences Foundational Knowledge Course (3 crhrs) (choose from approved courses on ESGP website)

Physical Sciences Foundational Knowledge Course (3 crhrs) (choose from approved courses on ESGP website)

Social Sciences/Policy Foundational Knowledge Course (3 crhrs) (choose from approved courses on ESGP website)

Entomology 7920 Presentation Skills for Interdisciplinary Scientists (2 crhrs)

Data Analysis Methods (3 crhrs) (choose from approved courses on ESGP website)

Specialization Requirements:

Microbiology 5155 (3 crhrs)
Microbiology 8161 (3 crhrs)

2 Elective courses (ranging in 1-3 credit hours per course from a list of approved courses

Remaining credits are to be fulfilled by research hours in your advisor's home department planned between you and your advisor. 30 credit hours required for the MS

ESGP PhD General Curriculum

ENV SCI 7899 ESGP Seminar (1 crhr)

ENV SCI 7899 ESGP Seminar (1 crhr)

ENV SCI 7899 ESGP Seminar (1 crhr)

ENV SCI 5170 Sustainability and Pollution Prevention Practices (3 crhrs)

Biological Sciences Foundational Knowledge Course (3 crhrs) (choose from approved courses on ESGP website)

Physical Sciences Foundational Knowledge Course (3 crhrs) (choose from approved courses on ESGP website)

Social Sciences/Policy Foundational Knowledge Course (3 crhrs) (choose from approved courses on ESGP website)

Entomology 7920 Presentation Skills for Interdisciplinary Scientists (2 crhrs)

Data Analysis Methods (3 crhrs) (choose from approved courses on ESGP website)

Grant Writing (1-4 crhrs) (choose from approved courses on ESGP website)

Remaining credits are a combination of research hours in your advisor's home department and elective courses planned between you and your advisor. 80 credit hours required for the MS

ESGP PhD Microbiome Specialization Curriculum

ENV SCI 7899 ESGP Seminar (1 crhr)

ENV SCI 7899 ESGP Seminar (1 crhr)

ENV SCI 7899 ESGP Seminar (1 crhr)

ENV SCI 5170 Sustainability and Pollution Prevention Practices (3 crhrs)

Biological Sciences Foundational Knowledge Course (3 crhrs) (choose from approved courses on ESGP website)

Physical Sciences Foundational Knowledge Course (3 crhrs) (choose from approved courses on ESGP website)

Social Sciences/Policy Foundational Knowledge Course (3 crhrs) (choose from approved courses on ESGP website)

Entomology 7920 Presentation Skills for Interdisciplinary Scientists (2 crhrs)

Data Analysis Methods (3 crhrs) (choose from approved courses on ESGP website)

Grant Writing (1-4 crhrs) (choose from approved courses on ESGP website)

Specialization Requirements:

Microbiology 5111 (3crhrs)
Microbiology 8161 (3crhrs)

2 Elective courses (ranging in 1-3 credit hours per course from a list of approved courses

Remaining credits are to be fulfilled by research hours in your advisor's home department planned between you and your advisor. 80 credit hours required for the MS

Letter of Support

THE OHIO STATE UNIVERSITY
CENTER OF MICROBIOME SCIENCE

Enterprise for Research, Innovation and Knowledge
Columbus, OH 43210

https://coms.osu.edu/
microbiome@osu.edu
@OsuMicrobiome

October 15, 2024

To Whom It May Concern:

I am writing on behalf of the Center of Microbiome Science to offer our full support of the Microbiome Sciences Specialization within the Environmental Sciences Graduate Program. The Center of Microbiome Science was launched in 2020 and supports over 116 faculty across 9 colleges. Our Center is already recognized nationally and internationally for its innovative curriculum and training. Microbiome science and its applications have grown exponentially over the last several decades, and it has now become critical to produce scientists who are trained in the theory, approaches, and analyses of microbial communities across disciplines.

Trainees within the ESGP Microbiome Sciences specialization will have access to the full resources of CoMS which includes our annual symposia, workshops, webinars, seminars, working groups, curriculum, and the Microbiome Platform which offers guidance for microbiome science projects as well as extraction, sequencing, and analysis for microbiome projects. This ESGP specialization is a critical next step in advancing microbiome science training for the next generation of scientists, and we have worked together with ESGP to select and hone the curricular choices for this specialization.

If you have any further questions, please feel free to contact me.

Sincerely,

Vanessa L. Hale

Vanessa Hale, MAT, DVM, PhD
Acting Director, Center of Microbiome Science
Associate Professor, College of Veterinary Medicine
Ohio State University