

# Regent's Teaching Excellence Award Nomination

## Department of Microbiology, University of Georgia



UNIVERSITY OF  
**GEORGIA**

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November 27, 2023

Award Selection Committee  
USG Regents' Teaching Excellence Award for Department or Program  
270 Washington Street SW  
Atlanta, GA 30334

Dear Members of the Award Selection Committee,

It is my great pleasure to nominate the Department of Microbiology at the University of Georgia for the USG Regents' Teaching Excellence Award for Department or Program. The Department of Microbiology has worked carefully and strategically to transform its bachelor of science program to address the academic, leadership, and career-readiness needs of its undergraduates. Notably, the department has focused on developing a career-centered curricular map, expanding leadership development, and creating clear career networking pathways for students as they work in the department's classes and research labs. The department has created a purposeful and planned undergraduate program, where students benefit from the opportunity to successfully individualize their educational experience to match their personal and career goals.

The Department of Microbiology began the transformation of its program six years ago, building on a foundation of teaching excellence among its faculty. The department first redefined its undergraduate program mission and then crafted clear outcomes to chart its progress. It developed the Microbiology Peer Assistant program to provide both leadership and peer learning opportunities for students and worked to showcase the leadership and contributions of undergraduate majors. The department supports students in pursuit of positions in external research labs, collaborates with industry partners to secure high quality experiential opportunities for students, and ensures that research experience is woven into the curriculum. Mindful of its students' overall wellness, the department has intentionally created opportunities for students to build community, both with each other and with UGA faculty and staff.

Responsiveness to student feedback is critical to the department's success. For example, annual surveys of microbiology students indicated two primary concerns: the availability of courses required for the major and the availability of resources to prepare them for a career. In turn, microbiology faculty rearranged teaching duties to offer both spring and fall semester courses for a core requirement, selected additional courses offered by other departments to count toward major course hours, and revitalized dormant courses so they could be offered again. The department launched a credit-bearing opportunity for students to engage with private companies and to further develop their research skillset through internship opportunities. Annual surveys now indicate that students most appreciate three specific aspects of the program: personal

interaction with faculty, varied research opportunities, and excellent academic and career advising.

The faculty in the Department of Microbiology also have a history of earning teaching awards, such as the Southeastern Branch American Society for Microbiology Green Award (5 awards to faculty since 1988) and the Sandy Beaver Excellence in Teaching award from UGA's Franklin College of Arts and Sciences (4 faculty since 1996). Faculty have been honored with UGA's CURO Excellence in Undergraduate Mentoring awards (including a 2023 CURO Mentor Award), a Sandy Beaver Teaching Professorship, the 2023 UGA Creative Teaching Award, and as members of UGA's Teaching Academy. Faculty from the department have also been instrumental in recent revisions to UGA's approach to the evaluation of teaching effectiveness, creating a more robust and intentional process.

The Department of Microbiology at UGA is a leader in promoting and engaging in teaching excellence, with a clear focus on their students' success both before and after graduation. It is with the strongest support and pride that I nominate the Department of Microbiology for the Regents' Teaching Excellence Award for Department or Program.

Sincerely,



S. Jack Hu

Senior Vice President for Academic Affairs and Provost

## **Narrative Statement**

### **Purpose and Philosophy**

As the only microbiology bachelor of science degree-granting department in the state of Georgia, the University of Georgia's Department of Microbiology faculty and staff take the task of training the next generation of scientists, entrepreneurs, and healthcare workers seriously. Over the last six years, the department made significant efforts to reform its bachelor of science program to address undergraduate academic, leadership, and career readiness needs. This revision was based on feedback from students and alumni and builds on the foundation of teaching and mentoring excellence demonstrated by faculty over the past several years. To anchor this curriculum revision initiative, the department developed a mission statement for the microbiology undergraduate program in 2020:

*The Microbiology undergraduate program is designed to train and equip students for leadership roles in their careers through their ability to critically analyze scientific evidence, deploy basic microbiological procedures, and communicate proofs and evidence effectively. The Microbiology Department will strive to create authentic research and leadership experiences, display effective teaching practices, and offer outstanding mentorship for undergraduates.*

Building on the foundation of this mission statement, the department implemented changes that increased active and experiential learning, provided leadership development, and fostered a greater sense of community among students, faculty, and alumni. Students are challenged to seize opportunities to individualize their UGA microbiology educational experience in alignment with personal career objectives. The outcome for the department is an undergraduate program that supports students' interests as well as provides cutting-edge knowledge to pursue careers in ever-changing science and health-related fields.

### **Program Goals**

Under the new program mission, the microbiology B.S. program's Student Learning Outcomes (SLOs) were revised to reflect the program goals outlining three aspects of Microbiology education: academic excellence, leadership training, and career readiness. Alignment of current and future potential courses with the new SLOs, along with a robust schedule of departmental events and training, were created into an all-encompassing map of undergraduate programming. The following goals formed the framework for this program map:

- *Goal 1:* Undergraduate coursework provides a diverse array of up-to-date content and training to align with future careers.
- *Goal 2:* Increase effective teaching strategies to provide teaching excellence; establish regular instructor pedagogical reflection and feedback.
- *Goal 3:* Promote student leadership by creating academic and extracurricular opportunities throughout the academic year.
- *Goal 4:* Increase career training through a larger variety of experiential learning opportunities for course credit.

- *Goal 5:* Bring a greater sense of belonging and community to students through faculty and alumni mentoring and peer-to-peer engagement.

## **Key Strategies and Initiatives to Meet Program Goals**

### ***Career preparation (Goal 1 and Goal 4)***

To enhance students' skillsets for various science career outcomes, directed research opportunities in UGA labs and external internships are offered to students as course credits and applied to degree completion. Students are guided by advisors and department-led informational sessions on how to identify and secure a position in a research lab to earn course credit. Once a student finishes one semester of research experience, they have the opportunity to continue a second semester in the same lab or to secure an internship with private industry. Collaboration with the Experiential Learning Office at UGA as well as departmental faculty help students connect with companies that offer internships. The results from these efforts are students graduating from the Microbiology B.S. program with technical and soft skills through almost 200 hours or more of research experience, providing them with an advantage in the workforce or for application to advanced degree programs.

To provide additional experiences to interested students outside of UGA, the Microbiology Department offered every summer through 2022 an NSF-funded Research Experiences for Undergraduates (REU) program. Students, particularly those from smaller institutions, were selected to come and visit UGA for eight weeks and participate in lab projects. Excursions to local private industries as well as the Center for Disease Control were included in the eight-week experience to introduce visiting students to a wide range of science-related careers.

### ***Enhancing teaching excellence (Goal 2)***

The Microbiology Department has a long history of excellence in teaching by individual faculty and now encourages all faculty to implement and increase evidence-based teaching practices. Regular faculty meetings include the sharing of effective teaching strategies. Annual faculty presentations to the department highlight student feedback on courses and the degree program and serve as a starting point to brainstorm new ways to create effective teaching approaches. The department's Undergraduate Affairs Committee reviews student learning outcome assessments annually as well as the program map to adjust courses as necessary. Several faculty members completed UGA fellowships that improved active learning strategies, implemented more writing into courses, and created online courses with universal design. In addition, faculty and staff have been recognized at the university level for their superior mentoring and teaching. Effective teaching strategies were implemented with upper and lower lab courses as faculty created an inquiry-based curriculum requiring data analysis and evaluation. Finally, faculty utilize three department-specific teaching tools annually: self-reflection, peer observation, and soliciting/assessing student feedback (in addition to end-of-semester feedback) for an annual review to enhance transparency in their teaching.

### ***Career and curricular mapping for the undergraduate program (Goal 1, Goal 3, and Goal 5)***

Upon review of current courses available to students in Microbiology, the curricular map was

turned into a career-centered map where specific courses or a series of courses aligned with job-related fields. To broaden the requirements for the degree program and further support the goal of connecting the curriculum to future careers, the Microbiology Undergraduate Affairs Committee identified and approved the new courses taught by departmental faculty and courses offered by other departments. Students are made aware of this broader curriculum/career map by promotion through the department's website and social media channels, as well as during advising appointments.

***Undergraduate leadership development (Goal 3)***

The Microbiology Department provides leadership opportunities by offering a peer learning assistant program for microbiology lecture and lab courses as well as supporting student club activities. The department developed the Microbiology Peer Assistant program (MPA) in 2017 for students who excelled in microbiology classes to assist faculty during introductory microbiology courses with in-class group assignments that utilize the process-oriented guided inquiry learning (POGIL) format. When pandemic-related instructional adjustments were made to create hybrid teaching labs, undergraduates were hired and trained to provide peer learning assistance to both lower and upper-level teaching labs. Funding from UGA's Franklin College of Arts and Sciences and the department continues to support the implementation of these Microbiology Lab Undergraduate Assistants (MULAs). The department also collaborates with a student club, the American Society of Microbiology UGA chapter, to promote leadership through officer and committee positions for various events. Other leadership opportunities through various campus groups and committees are highlighted regularly in a mid-week newsletter designed to encourage majors to take on leadership positions on campus and in the Athens community. Current microbiology majors who take on such roles are highlighted regularly on the department's social media posts to encourage others to consider applying.

***Bring a greater sense of community and networking opportunities to the Microbiology major (Goal 5)***

The Microbiology Department instituted many activities to increase a sense of community, provide mental health support, and strengthen networking among majors. Monthly events sponsored by the department and the department-sponsored student chapter (American Society of Microbiology) are offered. Activities such as creating art with microbes on solid growth medium and cooking up jam have been offered. Each semester, career-focused meetings feature alumni speakers who share their journey from UGA to their current jobs. Faculty members are often involved in these meetings, which provide opportunities for students to connect and form mentoring relationships. Participation in the UGA Mentor program, where students meet regularly with Microbiology alumni, is highly encouraged and promoted. Additional activities such as trivia night, trips to local research facilities, guest speakers from various government and private industries, and ice cream socials help to connect students, faculty, and alumni. The annual student survey indicated that one-third of respondents listed a sense of community through connections with faculty and peers as one of the best aspects of the microbiology major.

## Fact Profile

The Department of Microbiology at the University of Georgia offers B.S., M.S., and Ph.D. degrees as well as six different five-year combined Microbiology B.S. and M.P.H./M.S. programs. The B.S. program is offered to students at both the Athens and Griffin campuses. Microbiology represents the intersection between several disciplines including genetics, ecology, physics, biochemistry, and infectious disease. The department is vital to the mission of UGA in providing courses and research training for STEM majors, particularly those who are pursuing scientific or health-related careers.

**Instructional team** The Microbiology Department has 16 tenure-track and 4 full-time teaching faculty; 13 of the 20 regular faculty teach undergraduate-level courses. The tenure-track faculty consists of three assistant professors, three associate professors, and ten full professors. The teaching faculty is composed of two full-time lecturers and two full-time senior lecturers. Women constitute 52% of faculty and people of color compose 15% of faculty.

Faculty are frequently honored for their contributions to student success and excellence in teaching with awards such as the Southeastern Branch American Society for Microbiology Green Award in teaching, the UGA Franklin College Sandy Beaver Teaching Excellence Award, and the Sandy Beaver Teaching Professorship. Additionally, faculty earned positions in teaching initiatives such as the UGA Senior Teaching Fellows, Writing Fellows, Online Learning Fellows, Service Learning Fellows, and the National Academies Education Fellow in the Life Sciences programs. Graduate students have been awarded the extremely competitive Graduate School's Excellence in Teaching Award and the department's annual Outstanding Teaching Assistant award. Regular and adjunct faculty also incorporate undergraduates in their research resulting in publications. In the last 20 years, at least nineteen peer-reviewed articles were published with microbiology undergraduates included as authors.

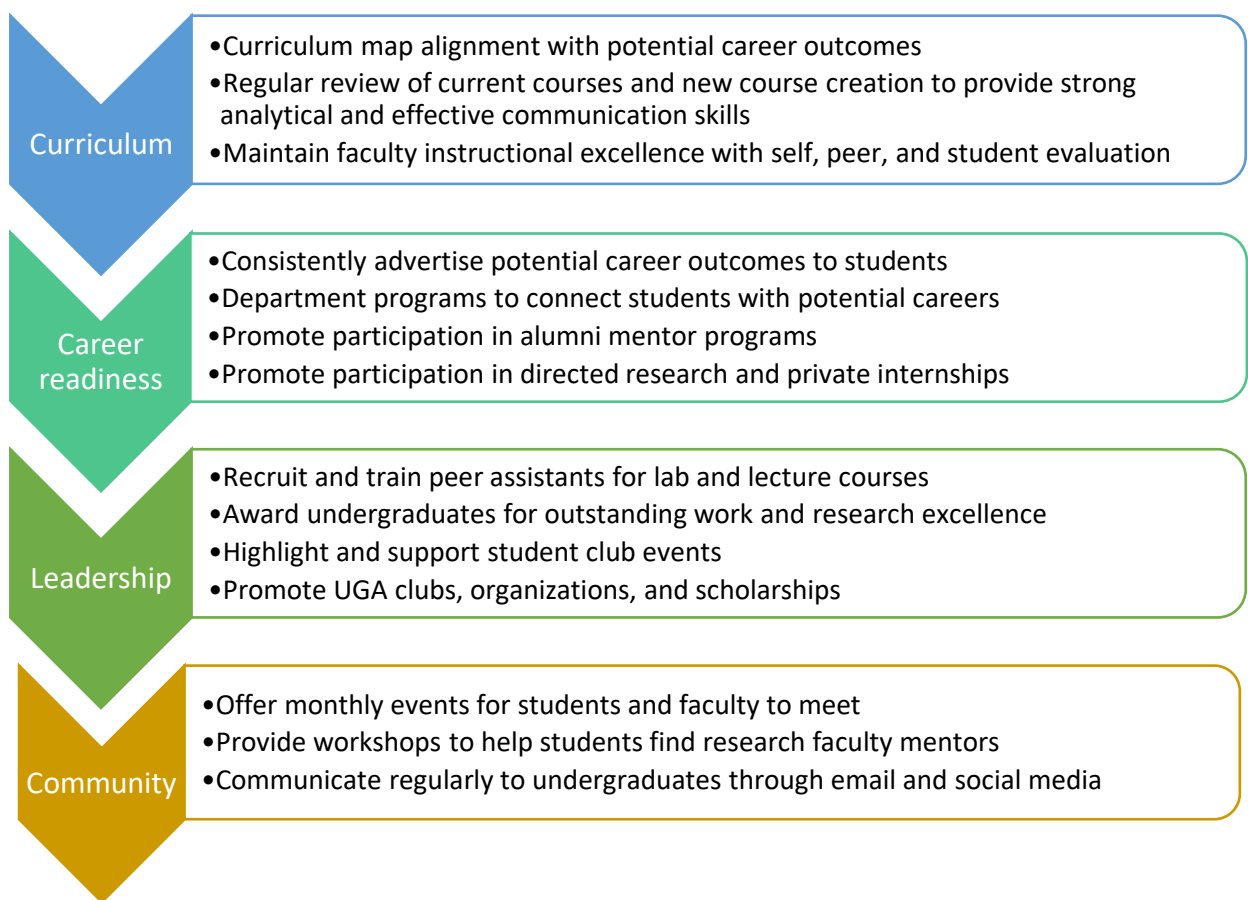
**Curricular role** The Microbiology Department provides courses and teaching labs for approximately 1,600 students per academic year. Students from several STEM majors, particularly those seeking health-related careers, are required to complete a microbiology course for entry into pharmacy, medical, dental, physician assistant, nursing, and veterinary programs. Additionally, microbiology faculty act as instructors for supervised research to roughly 100 students annually providing experience in a lab setting.

**Students** Approximately 135 undergraduate students are enrolled in the microbiology major annually. Women make up roughly 30% of microbiology students, and about 32% represent people of color. The department sponsors five awards for academic and research excellence, two for undergraduates and three for graduate students. Students graduate and move into advanced degree programs such as dental, pharmaceutical, medical, veterinarian, and research. Students also secure jobs in research-based industries, academia, government research divisions, public policy groups, healthcare-associated institutions, public health entities, scientific publishing groups, and many other fields.

## Evidence to Support Award Nomination

### Programmatic Changes and Initiatives

The Microbiology Department takes significant measures to review and refine its undergraduate curriculum and program to provide students with the skill set to succeed academically while developing leadership and career readiness skills within a supportive academic culture. Through the new mission statement of the department, courses are refined to train and equip students for critically analyzing scientific evidence, deploying current microbiological procedures, and effectively communicating scientific evidence. The Microbiology Department also strives to create authentic research and leadership experiences, display effective teaching practices, and offer outstanding mentorship for undergraduates. An outcome of this revision was a programmatic map developed to highlight four key areas.



**Review and revision of Student Learning Outcomes** A team of faculty and staff met in 2020 to review and update the undergraduate curriculum and Student Learning Outcomes. Previously, two of the four SLOs assessed specific microbiology knowledge while a third assessed lab skills, and a fourth assessed students' ability to perform the scientific method. Based on empirical evidence from Wiggins and McTighe (2000) deep student learning is achieved when other skill sets such as analysis and application are used with content knowledge. To align with the 2008-2009 *Vision and Change for Undergraduate Biological Education* challenge in addition to the



current ASM Curriculum Guidelines for Undergraduates, the Microbiology Undergraduate Affairs Committee identified four broad categories for assessing student learning outcomes: 1) microbiology knowledge, 2) quantitative skills, 3) ability to convey scientific thought, and 4) research design, performance, and analysis skills. Key courses were identified that support the new SLOs and new courses were suggested for future creation. As courses are created, faculty will be purposeful about incorporating aspects of the new SLOs. An example of the previous SLO and the revised SLOs that refine the research and critical analysis is listed below in Table 1.

| Student Learning Outcome example (2016-2020)  | Student Learning Outcome example (2021-2025)  |
|---|---|
| <p><b>SLO:</b> Students will demonstrate competencies in the scientific method of investigation and hypothesis testing, which includes demonstrating an ability to formulate hypotheses and design experiments based on the scientific method; analyze and interpret results from various microbiological methods; use mathematical reasoning and graphing skills to solve problems in microbiology; and identify credible scientific sources and interpret and evaluate the information therein.</p> | <p><b>SLO:</b> Students will demonstrate the scientific method by hypothesizing, creating verifiable procedures, and then collecting, analyzing, and interpreting data by using basic microbiological lab skills</p> <p><b>SLO:</b> Students will apply quantitative skills of computational models and methods pertinent to the analysis of microbiological problems and data.</p> |

**Table 1.** Table of two Student Learning Outcomes (SLO) contrasting the previous SLO with the revised SLO. The updated SLO provides a more defined concept for assessing students’ ability to use the scientific method which can include both written, visual, and oral demonstrations.

**Course and career preparation initiatives** Annual surveys of microbiology students indicated a primary concern was the availability of courses required for the major as well as help with preparing for a career. In response, the faculty rearranged teaching duties to offer both spring and fall semester sessions for required courses, selected more specialized courses offered from other departments to count toward major course hours, and revised old courses to be offered again. Regarding career preparedness, a listserv for majors regularly posts part-time and full-time positions with local industries and government agencies to alert students to future job opportunities. Additionally, a team of faculty and staff formalized the internship process for students to earn course credit and partially fulfill major requirements. By partnering with the Experiential Learning Office at UGA, more companies interested in creating internships for Microbiology majors are being identified.

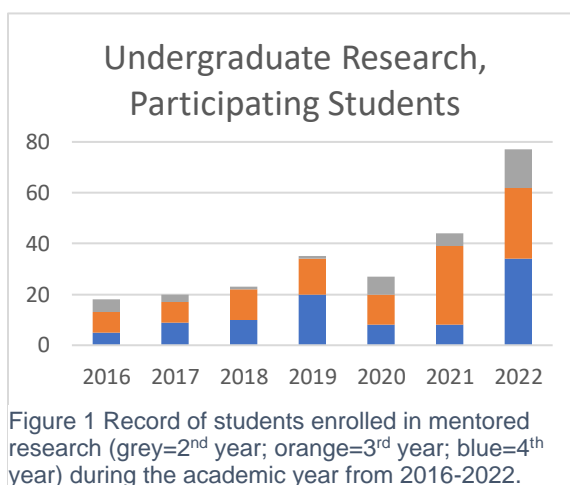
A Spring 2021 semester survey indicated that 80% of respondents valued the preparation for future careers, particularly through research opportunities and connections with faculty. Departmental events every fall and spring highlight faculty and alumni panels to help students select the career that best fits their skillset and passion. Weekly newsletters and social media posts make students aware of various career preparation opportunities with the

**“All the faculty seem really knowledgeable and easy to communicate with. I also really appreciate all the opportunities that are given on the listserv since I feel like it is hard to find applicable studies/jobs for an undergraduate.”**  
- student quote from department survey

UGA Mentor program, Center for Undergraduate Research Opportunities, summer internships, and major and elective courses that best prepare students for specific careers. In annual surveys of microbiology majors, students often express their gratitude for the department's efforts to provide consistent information provided on potential careers.

**Guidance for mentored research** As a requirement for the microbiology major, students can select two semesters of intensive research in a lab of their choosing. Students report this process of identifying a lab, communicating with a faculty member, and navigating novel research is daunting. A step-wise support system was set up to help students negotiate the process. *First*, during advising, students are shown the directed research webpage which provides guidelines as to what type of research labs they may be interested in contacting along with a sample email of what information and questions to ask the research faculty member. An informational session is also offered to provide tips on identifying a lab and approaching a faculty member. *Second*, after students identify a research faculty member who agrees to the directed research for course credit, forms are filled out by both the student and the faculty. These forms created by the department help set clear expectations on the respective roles of the student and the research mentor. *Third*, at midpoint, students are sent a survey to identify their research progress. Additionally, a guide to help them begin writing their research report (due at the end of the semester) is included. This “check-in” helps to identify and address possible problems early enough in the semester. If students indicate in the survey that there are issues with unmet expectations or feeling overwhelmed, the undergraduate coordinator schedules a meeting to help mitigate the problem. Typically, students return to their research with a better understanding of expectations and are more productive. *Fourth*, Students are sent emails at the end of the semester to provide writing guidelines again with an example research report. Students are connected with UGA's Writing Center if additional help is needed to construct the report.

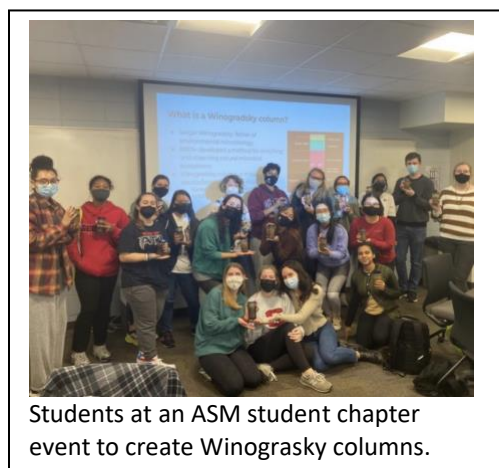
Over the last seven years, the undergraduate program successfully increased the opportunities for students to conduct novel research for course credit while being mentored in laboratories by graduate students, postdocs, and tenured faculty. As evidenced in Figure 1, the undergraduate program has seen a 327% increase in the number of students who participate in mentored research. From 2018, when only 13% of microbiology majors were registered for mentored research (18/134 students), the proportion of those gaining lab skills at the bench under the guidance of



experienced scientists is now 53% in 2022 (77/143). Most recently, the department collaborated with two study away programs to enable students to conduct research at the UGA

Sapelo Island campus and the University of Edinburgh, Scotland. Students are encouraged to seek out any microbiological project in any department and thus have been able to connect to faculty not only in their home department but also in other life science disciplines.

**Department-supported student club** The UGA American Society of Microbiology (ASM) boasts approximately 50 official members, consisting of microbiology, biology, biochemistry, genetics, and cell biology majors. Many members are involved in research on campus and events hosted by ASM allow them to meet peers as well as explore different areas of career interest. The chapter is also dedicated to community involvement evidenced by their visits to elementary, middle, and high school students to promote STEM education. The chapter aims to help members with professional development by offering events such as resume/personal statement workshops, alumni



Students at an ASM student chapter event to create Winogradsky columns.

panels, and guest speakers. Social events such as semi-formals, cookie decorating, and game nights, help build community and connections. The most anticipated event is Agar Art Night, modeled after the national ASM organization's contest. Students create art designs on agar plates with differently colored bacteria and the best design receives a prize. The Microbiology Department partners with the ASM student club to provide space for meetings, faculty mentoring for events, and supplies (such as agar plates) for special occasions.

**A sense of belonging** Developing a sense of belonging is another key aspect of the microbiology program. The department is purposeful in connecting students with peers, faculty, and alumni to help them with academic and career success as well as to create community. Monthly departmental events vary from formal alumni panels to informal student activities such as canvas painting their favorite microbe. Regular communication helps maintain connections through weekly email newsletters and social media posts highlighting programs and opportunities for students to find the right niche within the microbiology community. A variety of students are highlighted, with a focus on their various achievements, interests, and future career choices to promote many opportunities. As one student stated in a department survey: *"I switched my major to microbiology in early November. When I officially declared, I began to receive several emails through the listserv which my previous major did not do. I really enjoy the community aspect Micro has because it makes me feel like I am part of something."*

## Instructional Success

**First-year student experiences** To connect first-year students with research faculty, UGA offers first-year odyssey seminars (FYOS), in which microbiology faculty participate. While not

required for every department to offer FYOS, microbiology faculty created a course where students were led in the discovery process for biomedical research and how it connects to clinical applications. One faculty member, Dr. Anna Karls, developed a new service-learning class for first-year students, *Water Quality and Human Health*. Students received training for and participated in the collection and analysis of water and biological samples with the Upper Oconee Watershed Network and with the EPA's Microbial Citizen Science Initiative in Urban Watersheds. Students presented a poster on the results of their environmental samples analyses at the annual Sustainable UGA Semester in Review in 2018 and were featured in a front-page article of the *Athens Banner-Herald* in May 2019.

**Course revision with inquiry-based labs** A survey conducted in spring 2021 for the *Introduction to Microbiology* lab, MIBO 2500L, indicated that only 22% of students ranked the categories of “designing experiments” and “asking questions” as an important aspect of the lab. To move students into deeper collaborative experiences while using the scientific method, a completely revised inquiry-based lab curriculum was designed. Initial efforts began with consulting pedagogical research, collecting student ideas from surveys, and interviews with undergraduate lab

Student comment to lab Teaching Assistant after implementing lab curriculum changes: “Every Sunday night feels like Christmas Eve because I’m so excited to go to lab Monday morning.”

assistants. The outcome was an introductory microbiology lab course focused on ensuring student mastery of lab skills and cultivating scientific analysis skills through a semester-long lab project highlighting a case study and identifying the corresponding pathogen. Over the length of the course, assessments were shifted from weekly lab quizzes and two exams to student groups providing short oral presentations about their research progress along with lab report drafts for peer review. These assessments were intentionally designed to mimic how research is typically conveyed to other scientists and the public. While formal surveys are currently being employed to identify students’ perceptions of the revised lab, informal interviews have already shown students to be more engaged and highly invested in lab work for the course. Additionally, the upper-level lab course, MIBO 3510L was redesigned with a flipped format where lectures are replaced with in-class activities to prepare students for the lab exercises to follow. Moving away from labs that required students to simply follow directions for each experiment, MIBO 3510L is now designed for students to engage in novel research. Isolating bacteria and viruses from environmental sources and identifying host specificity is one of several elements added where the outcome is unknown and students must apply their microbiological knowledge to test and verify their findings.

**Course revision with service learning** Pathogenic Bacteriology MIBO4220/6220 is continually revised to involve more active learning strategies, including problem-based learning in a SCALE-UP classroom to facilitate collaborative learning. In 2013, instructors proposed a service-learning course design in which the format of the class was revised to accommodate in-class sessions for group work. Student groups were tasked with designing a hands-on research activity on bacterial pathogenesis to engage visiting groups of 9th graders, mostly from underrepresented minorities in the sciences, for the Experience UGA Biology field trips. Out-of-

class activities included setting up and running the pathogenesis research venue for the field trip and hosting groups of 9th graders, guiding them to different research venues given by life science researchers all over campus (organized by Dr. Anna Karls). The course continued in partnership with the Office of Service Learning for a number of years.

**Course revision with concept frameworks** To provide consistent instruction in lower and upper-level microbiology courses taught by various faculty across several sections, the microbiology undergraduate course coordinator developed concept frameworks. Concept frameworks outline every topic to be covered with introductory courses along with suggested topics for additional content. This provides each instructor with the content expected to be included in a course, which is particularly helpful for new instructors. In addition to the listing of content, active learning techniques are suggested to help faculty implement effective teaching strategies in the classroom. See Table 2 below for a sample:

**Excerpt from MIBO 3500 Core Content Concept Framework:**

**B. Learning goals:** *Students will understand how to apply knowledge about microorganisms, and how microbial activities contribute to the economy. Specific content will include some combination of examples from the following: rumen microbiology, microbes and fermented foods and beverages, food-borne illnesses, industrial microbiology and biotechnology, wastewater treatment*

**PUTTING IT TO WORK WITH ACTIVE LEARNING STRATEGIES:**

1. Consider a case study for small groups to discuss that addresses an industrial or wastewater application.
2. Consider a case study involving a food-borne illness where students identify possible causes and source. See CDC.gov and search "outbreaks" for examples.

**Table 2.** Sample of concept framework for Introduction to Microbiology course, MIBO 3500, along with suggested active learning.

**Experiential learning course** Starting in 2012, Dr. Karls and Dr. Ellen Neidle co-designed a new section of MIBO 4600L/6600L, in which they changed laboratory exercises from pre-set laboratory modules to contiguous original research projects. Both instructors were intensely engaged in the class, mentoring the multiple teams of students and keeping the research moving forward from one class period to the next. Students were involved in all aspects of the research, including experimental design and data analysis. Students also utilized a variety of bioinformatic, genetic, molecular, and biochemical approaches to characterize transcriptional regulation in bacteria. Dr. Karls designed a pedagogical study for this course in 2013: "Learning and Research Gains in a Semester-Long Undergraduate Laboratory Class Focusing on Characterization of Predicted LysR-Type Regulators (LTTRs) of *Acinetobacter baylyi* ADP1" and is currently writing the results of the study. In addition, research results from the class have been published: Bedore, Stacy R., et al. "Regulation of l- and d-Aspartate Transport and Metabolism in *Acinetobacter baylyi* ADP1." *Applied and Environmental Microbiology* 88.15 (2022): e00883-22.

**Teaching and Mentoring Excellence Awards** Microbiology faculty have a long history of earning teaching awards such as the Southeastern Branch American Society for Microbiology Green Award (5 awards to faculty since 1988) and the Sandy Beaver Excellence in Teaching award from Franklin College (4 faculty since 1996), along with a number of CURO Excellence in Undergraduate Mentoring awards, and one Sandy Beaver Teaching Professorship. Two current faculty are members of UGA's prestigious Teaching Academy while others participated in the Teaching Academy Fellows program, Online Learning Fellows program, Public Service and Outreach Fellows program, and Writing Fellows program. Two faculty were named National Academics Education Fellows in the Life Sciences 2013-2014. This extensive participation and recognition of teaching excellence is impressive as there have been only 20-24 faculty members in the Microbiology department over the last twenty



Dr. Ellen Neidle, recipient of the 2023 Creative Teaching Award

years. In addition, graduate students consistently strive for teaching excellence as evidenced by the five graduate students who earned UGA's highly competitive Excellence in Teaching Award from the Graduate School over the last seven years. This award is given to graduate students who have gone above and beyond their teaching duties. This year alone, Dr. Ellen Neidle was awarded 2023 UGA's Creative Teaching Award for her CURE-based MIBO 4600L course; Dr. Vincent Starai was awarded the 2023 CURO Mentor Award for his involvement with

mentoring students in research-based projects in his lab; and Ms. Yadira Castillo was awarded the 2023 Franklin College and the University of Georgia's Advisor of the Year.

**Competition teams and outreach** The Department of Microbiology hosted the University of Georgia iGEM (International Genetically Engineered Machine) team for five years. The team was centered in Dr. Whitman's laboratory in collaboration with Dr. Yajun Yan in the College of Engineering. iGEM is an international collegiate synthetic biology competition developed and located at MIT. The UGA team competed every



Georgia Environmental Scholarship award to UGA iGEM team, August 2014

year from 2012-2016. At the 2013 iGEM Regional Jamboree, UGA earned a silver medal as one of the youngest competing teams. In 2014, the team was awarded a bronze medal at the International iGEM Jamboree in Boston. In 2015, the team earned a Gold Medal and Runner-Up in the Measurement Category. In a typical year, 15 undergraduates and four graduate students from eight departments participated. This effort provided a unique platform for students to explore synthetic biology research and develop novel techniques. The iGEM team was also active in the community and raising awareness

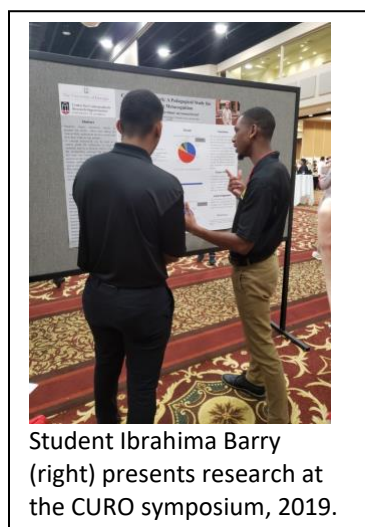
of synthetic biology. Teams conducted multiple outreach programs with the goal to inspire, educate, and inform the Athens community. In collaboration with FIMRC (the Foundation for

International Medical Relief of Children), the iGEM team presented a Health Education lesson on the spread of diseases at Oglethorpe Avenue Elementary School, Athens GA. The students also gave guest lectures at Clarke Middle School, put on science programs at East Athens Community Center, and guided Duluth High School of Gwinnett County in creating and running its own iGEM team to compete in the high school division. UGA iGEM also presented its research at various UGA graduate and campus seminars. UGA iGEM won the best undergraduate poster at the Bioenergy Systems Research Institute conference in May 2014. It was also awarded the Georgia Environmental Scholarship award for best undergraduate project at the Georgia Environmental Conference, the largest environmental conference in the state, in August 2014.

## Student Success

The Microbiology Department's undergraduate program offers several opportunities for student success and majors have taken advantage of these options as evidenced by first or second-author publications, conference/symposium presentations, research and conference travel awards, participation in NSF funded summer programs as well as microbiology peer learning assistant programs. Additionally, tracking of students after earning a B.S. in Microbiology shows that these opportunities provide experience and advantage in the job market and applying for advanced degree programs. The following sections detail the extent of student success in each area.

***Publications and Fellowships*** Since 2000, UGA microbiology undergraduates served as co-authors on at least 19 publications in peer-reviewed journals. Their studies are featured in high-impact journals such as the *Journal of Applied Microbiology*, *Journal of Bacteriology*, and *Applied Environmental Microbiology*. In addition, students received American Microbiology Undergraduate Research Fellowships for summer stipends as well as the UGA Center for Undergraduate Research Office summer research fellowships.

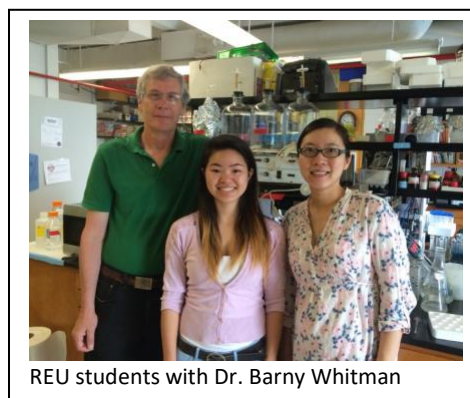


Student Ibrahim Barry (right) presents research at the CURO symposium, 2019.

***Conference/symposium presentations.*** Students are strongly encouraged to participate in the annual UGA Center for Undergraduate Research Opportunity's (CURO) Spring Symposium and apply for summer and regular semester scholarships. As research courses are a requirement for the microbiology major, all students are provided the opportunity to participate in the spring event. The Microbiology Department consistently sends students to the CURO symposium to participate in poster presentations. Additionally, students mentored by faculty have been afforded the opportunity to travel and present research at the Southeastern Branch of American Society of Microbiology, the SEC Symposium, Association of Southeastern Biologists, and the American Society of Microbiology Conference for Undergraduate Education. Travel

awards were provided by the Microbiology Department, sponsoring conference organizers, and UGA's College of Public Health.

**Summer research experiences** The Microbiology Department secured NSF funding to provide a Research Experience for Undergraduates (REU) for the last 20 years to over 170 undergraduate students coming from institutions that may not offer research opportunities. Eighteen of these students have been either deaf or hard of hearing and at least 19 of all participating students came back to UGA as graduate students. This funding provided housing, food, and travel for undergraduates to stay on the UGA campus for 8 weeks during the summer semester and work in a research lab mentored by a faculty member. Students who completed the REU program at UGA have been able to successfully enter graduate programs based on their research experience. In addition to hands-on research, additional enriching activities are included in the summer experience, including a responsible conduct of research discussion group; weekly research presentations by faculty, postdoctoral fellows, graduate students, and guest speakers; providing alternative perspectives on careers in science; a closing poster session; tours of local industrial and governmental biomedical research facilities; and social gatherings. Additional NSF funding secured by Dr. Vinny Starai allowed the department to expand recruitment efforts targeting minority students and students from Puerto Rican universities. The funding also created a new collaboration with Sacramento State RISE Scholars.

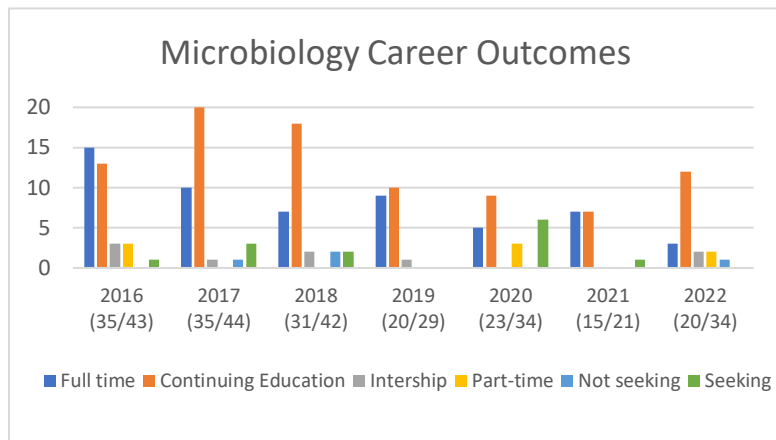


**Peer learning assistants** Since 2017, the Microbiology Department selects, trains, and implements its own cohort of volunteer peer learning assistants for both courses and labs. The Microbiology Peer Assistant program is designed to help participating students deepen microbiological knowledge, connect with faculty, and develop leadership skills while providing enhanced instruction and guidance for students in the classroom. MIBO peer assistants (MPAs) assist the instructor of record with active learning in the form of small group activities that are implemented in MIBO 3500 and MIBO 2500 courses. MPAs facilitate discussion and guide student groups during a class activity involving critical analysis of data and evaluation of results from peer-reviewed sources or a case study. An anonymous survey of MPAs during Fall of 2021 indicated that all assistants agreed or strongly agreed that participation in the program helped with their academic performance in other courses as well as helped them in their career objectives. A total of 87 students from various STEM majors, including microbiology, have participated in the MPA program thus far.

**Job and degree program placement.** Emphasis on skillset development in the microbiology undergraduate program has been key for enabling graduating students to find jobs or enter advance degree programs. Using data from UGA's Office of Institutional Research, the department tracked the career progression of students graduating with a Microbiology B.S. from 2016-2022. A majority of graduates (91% or higher) indicated placement in a job or higher



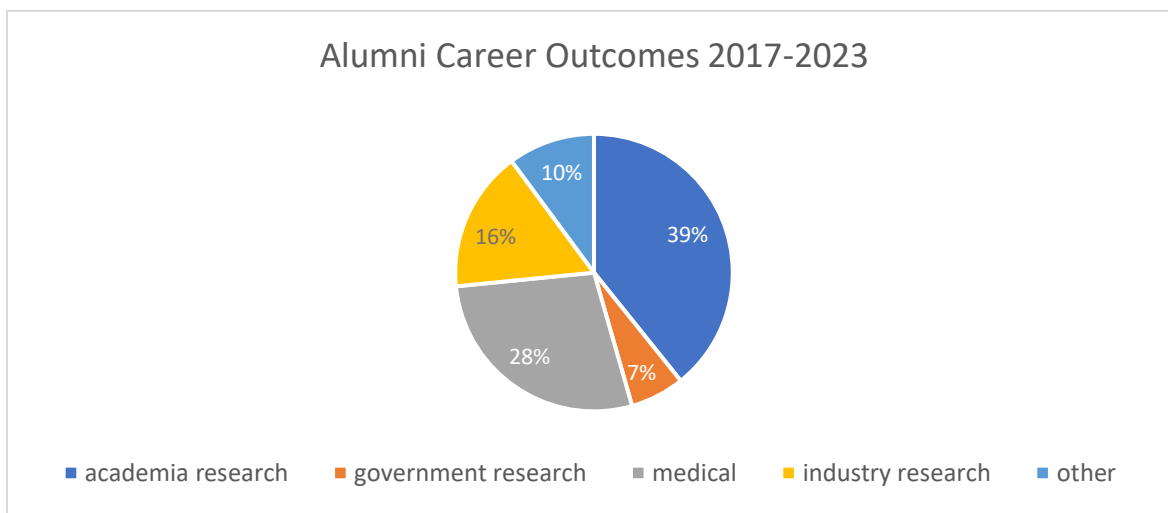
degree program after graduation in a variety of disciplines. Those that were not seeking a job or program indicated a “gap” year before applying for a program. See Figure 2 below.



**Figure 2.** Surveys of graduating Microbiology majors over the last 7 years indicate the majority of students are employed or entering higher degree programs. The year 2020 was the single exception due to the pandemic. Numbers in parenthesis indicates number of students responding/number of students graduating Spring semester.

Tracking of alumni from 2017-2023 who identified themselves on LinkedIn (n=79) indicated that 28% of graduates identified their current job status in medical careers (physicians, dentists, nurses, veterinarians, or public health associates). A majority of alumni, 39%, identified themselves within academic research as either pursuing a master's, PhD, or working as a paid lab position. Another 16% are currently working in industry as research technicians and research associates. Figure 3 below shows the various career outcomes or higher education programs graduates entered in the last 7 years.

This study indicates a majority of graduates enter research-affiliated careers and affirmed the goal of the undergraduate program’s new Student Learning Outcomes to emphasize students’ microbiology knowledge, quantitative skills, ability to convey scientific thought, and research skills, design, and analysis. The Microbiology Department will continue to reflect on career outcomes and adjust efforts to provide up-to-date training for the next generation.



**Figure 3** Tracking of alumni and their career outcomes from 2017-2023 on LinkedIn (n=79)