**Faculty Development Plan**

MMBIO Department, College of Life Sciences

In the preparation of this plan and in my efforts to execute it, it is my intent to find ways to contribute to the Mission and Aims of a BYU education. In so doing, I seek to contribute to the role of the MMBIO department in its unique contributions to the Mission and Aims of BYU.

In this plan, I outline 1) my strengths and interests, 2) my goals for the coming 5 years at BYU, 3) the relationship between my goals and the standards of the MMBIO department and the university, 4) a description of resources needed to achieve these goals, 5) progress to-date on these goals and plans, and 6) a description of the metrics that will indicate success in achieving these goals.

1. **Self Assessment of strengths, skills, competencies, interests, opportunities and areas in I hope to develop**
    a. Strengths, Skills, and Competencies
        i. Depth of knowledge in disciplines of bacteriology and plant pathology
        ii. Experience and enjoyment working with students 1 on 1
        iii. Determination and focus
        iv. Bacterial molecular biology
        v. Time management
    b. Interests
        i. Working with students
        ii. Plant-microbe interactions
        iii. Food security
    c. Opportunities
        i. Intermountain region, home to potato & sugar beet production.
        ii. Improve organization
        iii. Development of teaching skills
    d. Development desires
        i. Grow in faith
        ii. Grow in ability to improve food security
        iii. Learn more microbiology, especially relating to biomedical applications to help students with interests in this area

2. **Professional goals in citizenship, teaching, and scholarship: and the plan to accomplish these goals.**
    *a. Citizenship*

    In my citizenship at BYU, it is my goal to be a citizen who contributes to the community at as many levels as possible, and to also be developing my skills and

abilities in this area, so that my capacities to serve increase over time. The following represent my initial development goals in citizenship:

i. Participate in committee work at the departmental level, and other levels as opportunities arise. This currently includes assignments on: the MMBio department curriculum committee, the College of Life Sciences Belonging Committee, and a Life Sciences college advisory committee on IT.
ii. Collaborate with others both intramurally at BYU and extramurally, which efforts are underway.
iii. Contribute to the bacteriology and plant pathology scientific communities at large, this is ongoing through participation in editorial boards and engagement in professional societies.

*b. Teaching*

I hope that my teaching will be inspiring to students. In my field of microbiology, this means helping students appreciate things we cannot see with our naked eye, but impact our lives every day. I hope that my students have greater love and appreciation for the Savior and His plan as they learn of the microbial and molecular details that are part of this world He created for us. I know that my personal preparation to teach and inspire will be critical to creating a learning environment that is most helpful to students. My current goals in this area are:

i. Refine and improve MMBio461 course structure and content
ii. Prepare and teach an initial term of MMBio221 (Spring 2025)
iii. MMBio294R/494R (mentored research) course refinement and development
iv. Prepare and teach an initial semester of MMBio360 (Fall 2025), which will include design and execution of a laboratory component
v. Continue to learn and develop as a teacher and implement improved teaching strategies
vi. Learn and develop ways to integrate my laboratory research with teaching

*c. Scholarship*

The research conducted in my laboratory will focus on the regulation and mechanisms of virulence in plant-pathogenic bacteria, with emphasis on using bacterial soft rot as our model system. The long-term purpose of this scholarship is to improve food security through improved understanding of interactions between

microbes and plants. The following principles provide the framework, metrics, and goals for the establishment of this research program at BYU:

i. Apply for extramural funding to support research activities
ii. Publish 2 manuscripts each year, with at least one of them primarily coming from research conducted in my laboratory
iii. Involve undergraduate students in research, providing mentoring and opportunities for experiential learning.
iv. Recruit at least 1 graduate student
v. Establish and participate in collaborative projects

3. **The relationship between individual goals and department and university aspirations and needs**

   My individual goals in citizenship, teaching, and scholarship address the needs and goals of the MMBio department. For example, my teaching in bacteriology and microbiology fills the needs of the department, and my scholarship on bacterial pathogens complements the group of researchers in the department who also work on bacterial pathogens. At the University level, all of these goals are set with an eye toward fulfillment of the mission of BYU and the Aims of a BYU education.

4. **Resources needed to accomplish the professional goals including budgetary support, equipment, time, etc.**
   a. Budget: The generous startup funds provided by the MMBIO department and College of Life Sciences have provided a strong initial fund to begin work, especially in the scholarship area
   b. Equipment: I have been provided with ample initial equipment to successfully initiate research projects on plant-pathogenic bacteria as outlined in 2(c) above.
   c. Time: The time provided by my department, especially in starting with a lighter teaching load has given me an excellent opportunity to start my laboratory work.
5. **The faculty member's activities and accomplishments so far in achieving the goals.**
   a. Citizenship
      i. I am currently serving as a part of the MMBIO department Curriculum committee
      ii. I am currently serving as a part of the Belonging committee in the College of Life Sciences and a college advisory committee on IT.
      iii. I am serving in editorial positions for two disciplinary journals – Molecular Plant Microbe Interactions and Frontiers in Plant Science (Plant Microbe Interactions section)
   b. Teaching

i. I am currently teaching a second semester of MMBIO461 and am working to implement improvements in the class for the current and future semesters.
ii. I have taught MMBIO294R/494R each semester/term and am working on implementation of plans to standardize expectations and target learning outcomes.
iii. Preparing to teach MMBio221 during Spring term 2025 and MMBio360 during Fall semester 2025.

c. Scholarship
i. Laboratory research projects are under development, refining protocols and generating preliminary data to apply for external funding.
ii. I have mentored or participated in mentoring over 20 students in participation in research projects thus far.
iii. Students have presented projects at ASM Intermountain Branch Meeting, the College of Life Sciences research conference, and we have successfully published our first manuscript.
iv. 2 manuscripts from previous work have been completed
v. I am participating in graduate recruitment, have had 3 students rotate in my lab, and have been in communication with incoming students about opportunities in my lab.

**6. The faculty member's comments, if desired, on measures used to assess success in his or her professorial responsibilities and in accomplishing the goals set forth in the plan.**

The goals set forth in this plan are intended to be easy to measure, and when possible, use the same metrics as used in the departmental policies on rank and status advancement, to ensure that efforts are being put into those areas that are most aligned to the goals and priorities of the Department, College, and University.

**Course Development Project Report**

Feb. 2025

**Brief Project Summary:**

To improve structure of the introductory mentored lab research for credit course (MMBio294R) so that students completing the course develop a shared core set of foundational laboratory skills that can be applied to diverse research projects.

**Current project status:**

For this project, this course was taught during the Fall semester 2024 and many of the intended goals were implemented, such as intentional design of projects during the semester as to provide all students experience with polymerase chain reaction (PCR) and agarose gel electrophoresis. Student instruction and coaching was also implemented through weekly group lab meetings as well as one-on-one meetings with students. As intended, students also developed research proposals as a semester-culminating project to demonstrate their understanding of their project and theoretical application of learned lab techniques. I feel that this project led to improved outcomes for the students compared to previous semesters, and that the experiences they obtained were better as they were more intentionally designed to cultivate core skills and competencies while also participating in a real research project. In spite of the successes, I feel that there is still more progress to be made, as the number of core skills and techniques that were accomplished was a smaller skill set than originally intended. Continued iteration in the current and upcoming semesters will allow for ongoing improvement and development of this course.

**Student Learning:**

The course syllabus previously had a section with the header "Course Objectives." As part of this project, this portion of the syllabus has been restructured and expanded to include headings: "Purposes of MMBio294R," "Course Objectives," and "Learning Outcomes." With this increased transparency and clarity for students, their ability to understand and work toward achieving the indicated objectives was increased.

In an effort to help students come out of the course with a vision toward future opportunities in laboratory settings, the final product produced was revised from a report of what was done during the semester into a research proposal that identifies next steps in the research project. With this change, students were able to still look back and reflect on

their experiences during semester, but to put it into a forward looking context of where future opportunities lie.

**Learning Environment:**

In this course, students meet regularly with the instructor in one-on-one meetings for training and guidance on lab projects. Students and instructor also meet regularly in group settings as weekly lab meetings. These abundant personal interactions throughout the semester allow for development of relationships, getting to know each other and build trust. I strive to find ways to share my experiences and efforts to live the gospel and encourage students to think about how we could modify our research projects to be oriented toward serving others.

**Processes of Improvement:**

This project is part of the process of improvement for course MMBio294R. Because this course is mentored lab research, I have been able to teach this course each semester while at BYU, each time with a small group of students. I am currently teaching this course and continuing to work to modify and improve the course for the benefit of the students. For example, in the current semester, we have modified the structure of the group lab meetings so that students have more opportunities to share their work more frequently, but for shorter periods of time each presentation.

**Scholarship Development Goals Report**

Feb. 2025

**Goals set for completion by end of 2024:**

1) Submit 1 original research article based on work completed at BYU on genetics of soft rot species present in commercial produce.
2) Submit 1 original research article based on work completed mostly prior to arrival at BYU on contribution of protease activity to virulence of bacterial leaf streak of barley.
3) Submit 1 grant proposal to either USDA-NIFA or USDA-NSF program on characterization of small RNAs in *Pectobacteria*.

**Other goals, not time bound:**

4) Involve undergraduate students in research, providing mentoring and opportunities for experiential learning
5) Recruit at least 1 graduate student
6) Establish and participate in collaborative projects

**Current scholarship goal status:**

Goal 1 has been accomplished, as with a group of undergraduate students we submitted a manuscript on our original work in November, and following peer review and a round of revisions it was accepted in December 2024. This also acts as evidence that Goal 4 is also being accomplished through current scholarship.

Goal 2 has been partially accomplished. The intended manuscript on the role of protease in bacterial leaf streak has yet to be submitted, but another manuscript based on prior work on bacterial leaf streak was submitted and accepted.

Goal 3 has not yet been accomplished as an external grant proposal is still in preparation and has yet to be submitted.

Goal 5 appears to be mostly complete as 3 graduate students have completed rotations in my lab in the recent months, and at the present time it seems that one of them will be joining my lab for the duration of their degree.

Goal 6 is an ongoing process that has also been largely successful during Fall 2024 as a collaborative project is underway with external collaborators at Harvard Medical School, and we are initiating steps on multiple collaborative projects with internal collaborators.

In the implementation of these goals, the strategies that were to be used were to schedule daily writing time, use self-imposed deadlines, and use weekly lab meetings to involve students in the writing process. In my view, the use of these strategies was very successful in propelling my scholarship forward. The greatest room for improvement lies in keeping the daily writing time consistent to maintain the forward momentum. I look forward to continuing to implement these strategies to continue to work with students in producing valuable scholarship.

**Citizenship Development Project Report**

Feb. 2025

**Initial Proposal Summary:**

To coordinate initiation of a journal club group focused on bacteriology to foster collegiality and internal collaborations.

**Project Status Feb. 2025:**

Although initially intended to be completed and have meetings initiated during Fall semester 2024, the process of developing a bacteriology-focused group has taken longer than anticipated. However, the invitations to engage in such a group led to profitable discussions with colleagues that have expanded the vision for the group to focus on discussions of BYU internal scholarship and writing efforts in addition to use of the group as a journal club focused on analyzing external scholarship. With improved focus and goals of the bacteriology group, we have been able to begin meeting in January 2025 and are currently meeting weekly. The discussions are rich, including both faculty and graduate students interested and invested in the group. It is clear that all can both contribute and benefit from the meetings. With an invested group, I am hopeful that this community will remain stable and has potential to expand to include more participants, both from within the MMBio department and from outside of the department.

**New Faculty Teaching Grant Request**

Feb. 2025

**Summary:**

Although microbes are all around us all the time, we typically cannot directly observe them. In teaching courses in microbiology and molecular biology, microscopic images are frequently used, but student experiences with live in-person microscopy are limited. This proposal seeks to make student microscopy experiences more accessible in the classroom so that students can have more opportunities to interact directly with the subject matter.

**Funds Requested:** $500

**Objective and Proposal:**

The objective of this teaching grant is to improve the student experience by providing equipment that can be used in a non-lab classroom to provide live experiences with microscopy and make the world of microbes more accessible as well as more meaningful. It is proposed to use the funds to purchase a portable hand-held microscope camera that can serve as either stereoscope or microscope to analyze samples in a classroom setting. This will facilitate more access to microscopy for students so that this type of learning by experience is not solely limited to what can be provided during a lab class but can also be provided in traditional classrooms. It is proposed to use the funds to purchase two units so that in addition to use for demonstrations in class, multiple student groups can take turns using the microscope at a time. Storage capacity for image capture by purchasing micro SD cards can allow students to use the images they capture with the microscopes in class projects. It is anticipated that this equipment will initially be used to enhance the student experience in MMBio221: General Microbiology (a course for non-majors who will likely not take lab courses involving microscopy) and MMBio461: Advanced Bacterial Physiology (a course for advanced microbiology majors who will benefit from additional hands-on experiences with microscopy).

**Proposed Expenses:**

2 MicroDirect 1080P HDMI Handheld Digital Microscope: $450 (2@$225 each)
2 Micro SD storage cards: $50 (2@$25 each)