

(Excerpt from the approved MCLS proposal – 11/2005)

2C.2 Program Structure and Curriculum

Overview. The MCLS Ph.D. degree combines course work with original scientific research, the greater emphasis being on the latter. In addition, there will be a minimal teaching requirement for all MCLS students. The program structure (described below) includes a series of four laboratory rotations during the first two semesters in MCLS labs of the student's choosing. The rotation format (common to most MCLS-type programs) allows students to sample diverse research settings, while learning universally valuable techniques in the molecular and cellular life sciences. The rotation is also valuable to mentors, who will evaluate the suitability of students to a particular research program. Rotations will also serve as an assessment tool to the program in general. As described below, students will also take a core curriculum and will choose from a diverse selection of elective courses appropriate to their selected research focus.

Coursework. A total of 72 credit hours will be required for graduation. This is consistent with the requirements of the graduate school and with the requirements for foreign graduate students at the University of Wyoming (Graduate Bulletin, 2002–2004, p. 16). Students are expected to maintain full-time status and be enrolled in a minimum of nine credit hours per semester throughout the duration of their studies. This is especially important for foreign students to maintain their visa status. There are some exceptions to this requirement as detailed in the Graduate Bulletin.

Two critical parameters guided our design of the MCLS curriculum. First, we considered it important to minimize the number of new courses necessary for implementation and second, we elected to make full use of the excellent instruction that already exists among participating departments. Consequently, we have arranged the curriculum as follows:

- At least 42 of the 72 credit hours that are required must be earned in course work at the 4000 level or above. This will include credits earned for each laboratory rotation as well as more formalized lecture-style courses.
- Credits may be earned for Dissertation Research.
- Students must obtain at least a B in all mandatory courses, including laboratory rotations.
- Students must maintain no less than a 3.0 GPA overall. Graduate credit will not be given for grades lower than a C.

Mandatory courses. Obligatory coursework in the first year will include the following:

- Two semesters of biochemistry/molecular biology (MOLB5600, MOLB5610). Exceptions will be made for students who have previously taken courses equivalent to MOLB 5600 and MOLB 5610 in which they obtained a grade of A. Such students, if desired, can place out of this requirement and proceed more directly to the elective options.
- Two semesters of a new interdisciplinary literature-based course. Students will learn critical reading and evaluation of the current scientific literature.

- One semester of a new introductory “Cornerstone” class, designed specifically for MCLS students, will also be required. This latter course, which will be taught on a rotating basis, will initiate with a series of 15-minute summary presentations by (all willing and interested) MCLS faculty on their research. The course will cover basic information such as statistical analyses, database mining, scientific ethics, and methods of undergraduate instruction, as well as other subjects that are of practical value to the field. The course will also spell out expectations for student productivity and work ethics.

Elective courses. In addition to the core requirements, students must obtain 12 additional credits in approved elective courses. The current set of elective courses (see below), were selected after open discussion among the MCLS participating faculty and the MCLS steering committee. The majority of electives would typically be taken in the second year, after the student has chosen a lab for dissertation research. For students placing out of MOLB 5600 and/or MOLB 5610, additional elective courses would be substituted early on. Options for elective courses (most of which are offered on an annual basis) would include, but are not limited to, the following:

1. Mass Spectrometry and analytical Chemistry (CHEM 5200 Basile)
2. Biomedical Engineering (CHE 5160 Rosinski)
3. Biophysics (CHE 5180 Rosinski)
4. Cell Culture and Virology (Jarvis)
5. Cell and Developmental Genetics (5450; Fay)
6. Topics in Genomics (Sylvester)
7. Introduction to Bioinformatics (MOLB 4990-01)
8. Mammalian Physiology (ZOO 5240)
9. Mammalian Endocrinology (ANSC 5260)
10. Microbial Genetics (5440; Petersen)
11. Microbial Physiology and Metabolism (MOLB 5460; Gomelsky)
12. Pathophysiology (PHY6220)
13. Plant Physiology (BOT 5440; Herbert)
14. Protein Structure and Function (MOLB 5650)
15. Replication, Transcription and Translation (MOLB 5660)

Additional courses will be added to this list with the approval of the MCLS Curriculum and Advisory Committee. In addition, efforts will be made to modify these existing courses (over time) to accommodate the interdisciplinary interests and backgrounds of MCLS students. We also note that course designations bearing the MCLS heading will include the cornerstone course, the literature based class, laboratory rotations, and credit for dissertation research.

Laboratory rotations. Students will carry out four eight-week laboratory rotations (from at least two departments) during the Fall and Spring semesters of the first year. Students are expected to gain a basic understanding of the science, learn selected laboratory protocols, and generally participate in all lab-related activities such as group meetings. Students will receive a rotation grade assigned by the faculty advisor. In addition,

rotation advisors will evaluate student's performance using a form designed by the Curriculum and Advising Committee.

Choosing a laboratory for dissertation research. Towards the end of the fourth rotation, students will choose a permanent home laboratory for future dissertation research. This decision must be a mutual agreement between the prospective advisor and student. In addition, entry into individual laboratories will require the approval by the Curriculum and Advising Committee, which will examine the performance of the student to date. Finally, students must be able to identify a lab for future studies that is capable of supporting them beginning in the second year. In the event that a student has not identified a sponsoring lab after four rotations, a fifth rotation may be permitted after evaluation by the Curriculum and Advising Committee.

Preliminary exams and dissertation oversight. The following guidelines have been established as benchmarks of student progress towards the doctoral degree:

1. Following entry into individual labs, students must assemble a dissertation committee of five members of the MCLS faculty (including the primary advisor and committee members from at least two departments). Students must then file an initial Program of Study signed by the student's dissertation advisor, the dissertation committee, and the Graduate school.
2. At the end of the first year, students must pass a practical exam that will be administered by the Curriculum and Advising Committee. The exam will cover a number of rudimentary laboratory skills such as calculating the molarity of solutions, interpretation of basic data, etc. Based on this exam, student GPA, rotation evaluations, and discussions with the chosen dissertation advisor, the Curriculum and Advising Committee will assess student merit for advancement in the program.
3. Preliminary exams will be conducted during the second year in late spring or early summer (assuming completion of at least 30 credit hours). The exam will consist of both written and oral components. Students will be required to prepare a written research proposal in a field that is, at most, indirectly related to the subject of their dissertation research. This proposal will also be presented and defended in oral format. In addition, a formal dissertation plan and progress report must be submitted at this time, to be defended at a second meeting. Following the successful completion of both phases of the preliminary exam, students are admitted to candidacy for the doctoral degree and will have a maximum of four calendar years to complete their degree.
4. Annual meetings of the graduate dissertation committee will begin in the spring of the third year. These meetings will be used to evaluate the progress and status of the student, but are also intended to guide the student and primary advisor in setting future goals. Committee members may also act as advocates for either the student or the advisor in the event of conflicts. Committee members are also

expected to make themselves available to the student and advisor between annual meetings as needed. Members of the dissertation committee will submit a short annual report on student progress to the Curriculum and Advising Committee for review.

5. MCLS students will be required to attend annually the UW Graduate School Symposium and will participate directly at an appropriate stage of their research program. MCLS faculty will also attend the Symposium and will participate by serving as judges. Attendance and participation in the symposium will be included as part of the annual review process. We suggest that the Graduate School Symposium be topically organized so that MCLS presentations are grouped within the same session. We anticipate that this will improve both faculty and student interest and attendance.
6. Students will complete a body of original and independent research that is acceptable to their dissertation committees. It is expected that all dissertations will result in at least one first-author publication for the student, preferably prior to assembly of the dissertation itself. Following approval of the written dissertation by the dissertation committee, the student will carry out an oral defense of the dissertation at a public seminar. Following a successful private meeting of the student, his or her advisor, and the dissertation committee, the student will be recommended by the program for the degree of Ph.D. to the Graduate School.

2C.3 Graduate Assistantship Responsibilities. Students will be required to teach at least one full course during their graduate careers. The timing and nature of this teaching will be flexible and will be worked out by the student, his or her advisor, the Curriculum and Advising Committee, and the Graduate School. Students are not strictly prohibited from seeking additional teaching experience; however, this would be arranged with their advisors and the Curriculum and Advising Committee. Mentoring for new instructors would also be provided in the cornerstone course, as described above in Section 2C.2.

2C.4 General Expectations of Students. As a result of the training received, MCLS students will be expected to:

1. Acquire in depth expertise and an advanced level of sophistication in the areas of molecular and cellular biology.
2. Gain the ability to integrate knowledge and practical skills from across disciplines.
3. Be scholarly and versatile researchers.
4. Be capable of critical, independent, and creative thinking.
5. Compete in a pressurized and rapidly evolving research and teaching environment.
6. Communicate with their scientific peers as well as the general public.
7. Value, comprehend and convey the broad impact of their work.
8. Appreciate the value of multidisciplinary scientific approaches.
9. Understand and uphold the highest level of professional ethics and integrity.