



Program in Molecular, Cellular, and Developmental Biology

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To: Office of Academic Affairs

From: David Bisaro, Director, MCDB Program
Professor, Dept. of Molecular Genetics

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Re: Semester Program Proposal for the MCDB MS Program

The Interdisciplinary Graduate Program (IGP) in Molecular, Cellular, and Developmental Biology (MCDB) currently consists of ~130 PhD students and ~170 faculty representing 25 departments in six colleges. Program funding is provided by the Council of Life Sciences Deans. Currently, the Lead Dean is Dr. Robert Brueggemeier (College of Pharmacy), who has direct oversight of MCDB and related IGPs, including the Ohio State Biochemistry Program (OSBP), the Biophysics Program, and the Neuroscience Program.

The MCDB program was most recently reviewed by the Graduate School's Life Sciences Task Force (2008/09), and an external review initiated by the Council of Life Sciences Deans was carried out in 2004. No significant curricular deficiencies were noted in these reviews.

MCDB admits only PhD students. However, the program offers the MS degree for students opting to end graduate studies, as a means of acknowledging their advanced study and research.

MCDB will convert the following from quarter to semester format:

- 1) MS in MCDB
- 2) PhD in MCDB

This proposal concerns the MS program. The MCDB Graduate Studies Committee (GSC) and subsets thereof have been working on aspects of semester conversion for the past year. The curriculum described in this proposal was prepared by the GSC (David M. Bisaro, Chair, Maki Asano, Christopher Bartlett, Dawn Chandler, Chen Gu, Tsonwin Hai, Heithem El-Hodiri, and Harald Vaessin) and unanimously approved during the Summer Quarter, 2010.

The MCDB core curriculum is drawn from courses taught by the departments of Molecular Genetics (Mol Gen), Biochemistry (Biochem), and Molecular and Cellular Biochemistry (MCB). The Director of the MCDB program was invited and contributed to departmental discussions that directly concerned the MCDB core, and the program is in agreement with the semester

conversion plans for these courses.

The only courses offered by MCDB are: 1) First Year Student Orientation (MCDB/OSBP 7600, 1 semester credit), which contains an expanded research ethics module as well as introductory material for new students; 2) Seminar in MCDB (MCDB 7890, 1 semester credit), which includes presentations by students, faculty, and prestigious external speakers; 3) MCDB Seminar Presentation (MCDB 7891, 2 semester credits), as MCDB 7890, except used in those terms when the student is presenting. 4) Individual Studies (MCDB 5693, 1 to 3 semester credits), readings or special assignments in selected advanced topics; and 5) Laboratory Rotations (MCDB 7780, 1 to 6 semester credits). After completing three first year lab rotations, students register for Dissertation Research using their advisors departmental registration number (X 8999).

Program Rationale

MCDB graduate study emphasizes an integrative approach to the discipline, encompassing the molecular, cellular, and organismal levels of organization. Students undergo training in a core of courses in molecular biology, cell biology, developmental biology and biochemistry. The main goal of the proposed plan is to provide a flexible curriculum that imparts basic core knowledge while allowing appropriate elective courses and maximum opportunity to pursue research.

A typical graduate program begins with a course-intensive first year of study, followed by some additional coursework in the second year. The following courses will constitute the core: Mol Gen 5701 (DNA Transactions and Gene Regulation, 4 semester credits), Biochem/MCB 6761 (Proteins and Macromolecular Structures, 3 semester credits), Mol Gen 5705 (Advances in Cell Biology, 2 semester credits), and Mol Gen 5715 (Developmental Genetics, 2 semester credits).

The most consequential changes to the core due to semester conversion include the merging of Mol Gen 701 (DNA Transactions) and Biochem 702 (Regulation of Gene Expression) into a new four-semester credit hour course (Mol Gen 5701, DNA Transactions and Gene Regulation), and the merger of Biochem/MCB 761 (Proteins) and Biochem 766 (Nucleic Acids) into a three-semester credit hour course (Biochem/MCB 6761, Proteins and Macromolecular Structures). These changes will reduce the number of credit hours in the core sequence from 18-quarter credit hours to 11-semester credit hours, a one-hour reduction in terms of semester credits. Additional elective courses may be chosen from an GSC-approved list at the 5000-level or above, with input and approval of the dissertation advisor for those taken after the first year. The elective list is flexible so that the individual needs and interests of each student can be met, and additional courses may be added with advisor and GSC approval.

Transition Policy

No student will be negatively impacted or have their degree progress impeded by the quarter to semester conversion process. Our curriculum does not include multi-course sequences, and students will complete core courses during the first year. Second year courses will mostly consist of electives. No significant changes in course offerings are anticipated with the start of semesters. Finally, as student advising is already done on an individual basis, no additional personnel are required to advise students during the transition.

Potential issues created by the merged core courses will be handled as follows:

- 1) Mol Gen 5701: Mol Gen 701 and Biochem 702 are currently taken in consecutive quarters during the first year, so as a rule students will not be affected by their merger into Mol Gen 5701. However, should a continuing student fail either Mol Gen 701 or Biochem 702 the year prior to semester conversion, they will register for 3 credits of MCDB 5693 (Individual Studies) in the following year. This will allow further study and examination of the failed material.
- 2) Biochem/MCB 6761: Students who enter the program the year prior to transition will be advised to delay biochemistry coursework in favor of electives, and will take Biochem/MCB 6761 in their second year.

The MCDB MS Program- Semesters

In the context of the MCDB Program, the Master's degree constitutes a minor component of graduate training. Except in unusual circumstances, applications specifically for MS degrees will not be approved for admission. The degree as awarded by MCDB usually provides an exit route for those students opting to end graduate studies in the program following a decision not to pursue a doctoral degree, and acknowledges their advanced study and research.

There are two routes to the MS degree. Both conform to Graduate School requirements, including total credit hour requirements, minimum GPA of 3.0, and the format of the final Masters exam (including both written and oral components).

Common to Thesis (Plan A) and Non-Thesis (Plan B)

1. A minimum of 12 semester credits at the 5000 or 6000 level, excluding credit for seminar courses (MCDB 7890, MCDB 7891) and research (MCDB 7780, X 8999).

Required courses include (core plus first year student orientation):

Mol Gen 5701 - DNA Transactions and Gene Regulation (4 credits)

Biochem/MCB 6761 - Proteins and Macromolecular Structures (3 credits)

Mol Gen 5705 - Advances in Cell Biology (2 credits)

Mol Gen 5715 – Developmental Genetics (2 credits)

MCDB/OSBP 7600 – First Year Student Orientation (1 credit)

2. A minimum of 8 semester credit hours of research (either MCDB 7780, or X 8999).
3. Elective courses at the 5000 level or above may be included but are not required.

Elective courses may be used to fulfill the requirement of 30 semester credit hours.

These will be selected from courses offered by the Departments of Biochemistry; Microbiology; Molecular and Cellular Biochemistry; Molecular Genetics; Molecular Virology, Immunology, and Medical Genetics; Neuroscience; Pathology; Pharmacy; Plant Pathology; Statistics; and Veterinary Biosciences. The elective list will be both extensive and flexible so that the individual needs and interests of each student can be met. Other electives may be substituted with the permission of the advisor and the GSC.

4. A minimum of 30 total semester credit hours with a GPA of 3.0.

Unique to Thesis (Plan A)

5. Satisfactory completion of a written thesis that is approved by the students committee.
6. Satisfactory completion of a final oral exam.

Unique to Non-Thesis (Plan B)

5. Satisfactory completion of a final written exam/report.
6. Satisfactory completion of a final oral exam.

Successful completion of the PhD candidacy exam can be used to meet requirements 5 and 6 for the non-thesis Masters degree.

Quarter-Based Requirements for the MCDB MS Common to Thesis (Plan A) and Non-Thesis (Plan B)

1. A minimum of 19 semester credits at the 5000 or 6000 level, excluding credit for seminar courses (MCDB 800, MCDB 890) and research (MCDB 693, X 999).

Required courses include (core plus first year student orientation):

Mol Gen 701 - DNA Transactions (3 credits)

Biochem 702 - Regulation of Gene Expression (3 credits)

Mol Gen 705 - Advances in Cell Biology (3 credits)

Mol Gen 715 - Eukaryotic Developmental Genetics (3 credits)

OSBP 760 - First Year Student Orientation (1 credit)

Biochemistry: Two courses required, one must be from list one (i). (6 credits)

- i) Courses focused on proteins:

Biochemistry 761. *Advanced Biochemistry: Proteins.*

Biochemistry 770. *Protein Engineering.*

Molecular and Cellular Biochemistry 762. *Advanced Biochemistry: Enzymes.*

Molecular and Cellular Biochemistry 824. *Enzymology.*

- ii) Other biochemistry courses:

Biochemistry 763. *Advanced Biochemistry: Membranes and Bioenergetics.*

Biochemistry 765. *Advanced Biochemistry: Physical Biochemistry.*

Biochemistry 766. *Advanced Biochemistry: Nucleic Acids.*

Molecular and Cellular Biochemistry 764. *Advanced Biochemistry: Integration of Metabolism.*

Molecular and Cellular Biochemistry 823. *Control of Cell Growth and Proliferation.*

Plant Cellular and Molecular Biology 735. *Plant Biochemistry I.*

Plant Cellular and Molecular Biology 736. *Plant Biochemistry II.*

2. Research is expected (either MCDB 693, or X 999), but no minimum is currently stated.
3. Elective courses at the 500 level or above may be included but are not required.

These are selected from courses offered by the Departments of Biochemistry; Microbiology; Molecular and Cellular Biochemistry; Molecular Genetics; Molecular Virology, Immunology, and Medical Genetics; Neuroscience; Pathology; Pharmacy; Plant Pathology; Statistics; and Veterinary Biosciences. The elective list is both extensive and flexible so that the individual needs and interests of each student can be met. Other electives may be substituted with the permission of the advisor and the GSC.

4. A minimum of 35 total quarter credit hours with a GPA of 3.0.

Unique to Thesis (Plan A)

5. Satisfactory completion of a written thesis that is approved by the students committee.
6. Satisfactory completion of a final oral exam.

Unique to Non-Thesis (Plan B)

5. Satisfactory completion of a final written exam/report.
6. Satisfactory completion of a final oral exam.

Successful completion of the PhD candidacy exam can be used to meet requirements 5 and 6 for the non-thesis Masters degree.

Comparison of Masters degree under quarters and semesters				
Requirements	Plan A (Thesis) Semesters	Plan A (Thesis) Quarters	Plan B (Non-Thesis) Semesters	Plan B (Non-Thesis) Quarters
Coursework	Minimum of 12 semester credit hours of courses at the 5000-7000 level, excluding seminars (MCDB 7890, MCDB 7891), and research (MCDB 7780, or X 8999)	Minimum of 19 quarter credit hours of courses at the 700-800 level, excluding credit for seminars (MCDB 800/890) or research (MCDB 693 or X 999)	Minimum of 12 semester credit hours of courses at the 5000-7000 level, excluding seminars (MCDB 7890, MCDB 7891), and research (MCDB 7780, or X 8999)	Minimum of 19 quarter credit hours of courses at the 700-800 level, excluding credit for seminars (MCDB 800/890) or research (MCDB 693 or X 999)
Research	Minimum of 8 semester credit hours of MCDB 7780 or X 8999	MCDB 693 or X 999 credit hours expected, but no minimums currently stated	Minimum of 8 semester credit hours of MCDB 7780 or X 8999	MCDB 693 or X 999 credit hours expected, but no minimums currently stated
Elective Credit Hours	Additional coursework at the 5000 level or higher to reach the 30 semester credit hours required for the degree	Minimum of 9 quarter credit hours of elective coursework must be completed at the 600 level or higher	Additional coursework at the 5000 level or higher to reach the 30 semester credit hours required for the degree	Minimum of 9 quarter credit hours of elective coursework must be completed at the 600 level or higher
Thesis	Yes	Yes	No	No
Written Exam	Thesis	Thesis	Yes	Yes
Oral Exam	Yes	Yes	Yes	Yes