



Dr. David M. Bisaro
Professor and Director
201 Rightmire Hall
1060 Carmack Road
Columbus, OH 43210

Phone (614) 292-3281
Fax (614) 292-5379
E-mail bisaro.1@osu.edu

To: Office of Academic Affairs

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

Date: July 3, 2011

Re: Semester Program Proposal for the MCDB PhD 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 PhD 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. Students present a seminar once in year 2 and once in year 3. 4) Individual Studies (MCDB 5693, 1 to 3 semester credits), readings and 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. Doctoral 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. The curriculum will also allow MCDB students to complete all course work and advance to candidacy by the Spring or Summer Semester of their second year.

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 sequence include the merging of Mol Gen 701 (DNA Transactions) with 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.

The number of required elective courses will remain at three. Electives will 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. Electives 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.

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. The second year will in most cases only involve elective courses. 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 PhD Program- Semesters

A set of prescribed core courses are taken during the first year. At least three electives are additionally required and will be completed by the end of the second year. Students will identify their advisor and dissertation topic following three laboratory rotations, and no later than the end of Spring Semester of the first year. The candidacy exam will be completed in either Spring or Summer Semester of the second year. Following successful completion of the candidacy exam, students will enroll for one credit hour of MCDB 7890 (Seminar in MCDB) and two credit hours of Dissertation Research, or two credit hours of MCDB 7891 (Presentation in MCDB Seminar) and one credit hour of Dissertation Research, each Autumn and Spring Semester and three credit hours of Dissertation Research during Summer Semesters. After the third year, students register for three credit hours of Dissertation Research. While it is possible to complete the PhD by the end of the fourth year, most students will not complete their degree until the fifth year.

FIRST YEAR

Autumn Semester

1. Mol Gen 5701: DNA Transactions and Gene Regulation (14 weeks, 4 hours)
 2. Biochem/MCB 6761: Advanced Biochemistry: Proteins and Macromolecular Structures (14 weeks, 3 credits)
 3. MCDB/OSBP 7600: First Year Student Orientation (14 weeks, 1 credit)
 4. MCDB 7890: Seminar in MCDB (14 weeks, 1 credit)
 5. MCDB 7780: Laboratory Rotations (14 weeks, 6 credits)
- Semester Total: 15 credits

Spring Semester

1. Mol Gen 5705: Advances in Cell Biology (7 weeks, 2 credits)
2. Mol Gen 5715: Developmental Genetics (7 weeks, 2 credits)
3. Elective 1: (2 to 5 credits)

4. MCDB 7890: Seminar in MCDB (14 weeks, 1 credit)
 5. MCDB 7780: Laboratory Rotations (14 weeks, 6 credits)
- Semester Total: 13 to 16 credits

Summer Semester

1. X 8999: Dissertation Research (4 credits; register using advisor's departmental number)
- Semester Total: 4 credits

SECOND YEAR

Autumn Semester

1. Elective 2: (2 to 5 credits)
 2. MCDB 7890: Seminar in MCDB (14 weeks, 1 credit) or
MCDB 7891: Presentation in MCDB Seminar (14 weeks, 2 credits)
 3. X 8999: Dissertation Research (7 to 11 credits)
- Semester Total: 14 credits

Spring Semester

1. Elective 3: (2 to 5 credits)
 2. MCDB 7890: Seminar in MCDB (14 weeks, 1 credit) or
MCDB 7891: Presentation in MCDB Seminar (14 weeks, 2 credits)
 3. X8999: Dissertation Research (7 to 11 credits)
- Semester Total: 14 credits

Summer Semester

1. X 8999: Dissertation Research (3 to 4 credits)
- Semester Total: 3-4 credits

THIRD YEAR

Autumn Semester

1. MCDB 7890: Seminar in MCDB (14 weeks, 1 credit) or
MCDB 7891: Presentation in MCDB Seminar (14 weeks, 2 credits)
 2. X 8999: Dissertation Research (1 to 2 credits)
- Semester Total: 3 credits

Spring Semester

1. MCDB 7890: Seminar in MCDB (14 weeks, 1 credit) or
MCDB 7891: Presentation in MCDB Seminar (14 weeks, 2 credits)
 2. X 8999: Dissertation Research (1 to 2 credits)
- Semester Total: 3 credits

Summer Semester

1. X 8999: Dissertation Research (3 credits)
- Semester Total: 3 credits

FOURTH YEAR

Autumn Semester

1. X 8999: Dissertation Research (3 credits)
Semester Total: 3 credits

Spring Semester

1. X 8999: Dissertation Research (3 credits)
Semester Total: 3 credits

Summer Semester

1. X 8999: Dissertation Research (3 credits)
Semester Total: 3 credits

Grand Total: 81 to 85 Semester Hours

ELECTIVES

Electives will be selected from courses at the 5000-level or above 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.

MCDB PhD Program Sample Semester Program

Year 1

Autumn:		Spring:		Summer:	
Mol Gen 5701	4	Mol Gen 5705	2	X 8999	4
Biochem 6701	3	Mol Gen 5715	2		
MCDB 7600	1	Elective 1	2-5		
MCDB 7890	1	MCDB 7890	1		
MCDB 7780	6	MCDB 7780	6		
Total	15	Total	13-16	Total	4

Year 2

Autumn:		Spring:		Summer:	
Elective 2	2-5	Elective 3	2-5	X 8999	3-4
MCDB 7891	2	MCDB 7890	1		
X 8999	7-10	X 8999	8-11		
Total	14	Total	14	Total	3-4

Year 3

Autumn:		Spring:		Summer:	
MCDB 7890	1	MCDB 7891	2	X 8999	3
X 8999	2	X 8999	1		
Total	3	Total	3	Total	3

Year 4

Autumn:		Spring:		Summer:	
X 8999	3	X 8999	3	X 8999	3
Total	3	Total	3	Total	3

GRAND TOTAL: 81 – 85 Semester Credit Hours

Quarter-Based Requirements for the MCDB PhD

First Year:

Autumn Quarter:

- Molecular Genetics 701 - DNA Transactions [3hrs]
- *Biochemistry or Elective [3 hrs]
- MCDB 800 - Seminar in MCDB [1 hr]
- OSBP 761 - First Year Student Orientation [1 hr]
- MCDB 693 - Individual Studies (Lab Rotation) [3 hrs]

Winter Quarter:

- Molecular Genetics 705 - Advances in Cell Biology [3 hrs]
- Biochemistry 702 - Regulation of Gene Expression [3 hrs]
- MCDB 800 – Seminar in MCDB [1 hr]
- MCDB 693 - Individual Studies (Lab Rotation) [5 hrs]

Spring Quarter:

- Molecular Genetics 715 - Eukaryotic Developmental Genetics [3 hrs]
- *Biochemistry or Elective [3 hrs]
- MCDB 800- Seminar in MCDB [1 hr]
- MCDB 693 - Individual Studies (Lab Rotation) [5 hrs]

Summer Quarter:

- X 999 [7 hrs, 14 hrs for Fellowship]

Second Year:

Autumn Quarter:

- *Biochemistry or Elective [3 hrs]
- ‡MCDB 890- Interdepartmental Seminar in MCDB (Student Presenter) [2 hr]
- X 999 [5 hrs]

Winter Quarter:

- *Biochemistry or Elective [3 hrs]
- MCDB 800- Seminar in MCDB [1 hr]
- X 999 [6 hrs]

Spring Quarter:

- *Biochemistry or Elective [3 hrs]
- MCDB 800- Seminar in MCDB [1 hr]
- X 999 [6 hrs]

Summer Quarter:

- X 999 [7 hrs]

Third Year:

Autumn Quarter:

- MCDB 800- Seminar in MCDB [1 hr]
- X 999 [2 hrs]

Winter Quarter:

- MCDB 800- Seminar in MCDB [1 hr]
- X 999 [2 hrs]

Spring Quarter:

‡MCDB 890- Interdepartmental Seminar in MCDB (Student Presenter) [2 hr]

X 999 [1 hr]

Summer Quarter:

X 999 [3 hrs]

Fourth Year:

Autumn Quarter:

X 999 [3 hrs]

Winter Quarter:

X 999 [3 hrs]

Spring Quarter:

X 999 [3 hr]

Summer Quarter:

X 999 [3 hrs]

*Students are required to take three Elective Courses totaling 9 credit hours.

Also, in addition to Biochemistry 702 (taken Winter Quarter of Year 1), students are required to take two courses in Biochemistry from the list below. These are offered in various quarters, and all are 3 credit courses.

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

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.*

‡Students are required to take Student Seminar for three years (excluding Summer Quarter). On two occasions, once in the second year and once in third year, they are designated as presenters and register for MCDB 890 (2 credits, graded). This may occur in Autumn, Winter, or Spring Quarter. At other times they register for MCDB 800 (1 credit, S/U).

Course Listing and Curriculum Map for the MCDB PhD

Semester Course Number	Course Title	Semester Credit Hours	Quarter Equivalent Course Number	Quarter Credit Hours	Notes
Mol Gen 5701	DNA Transactions and Gene Regulation	4	Mol Gen 701 and Biochem 702	3 + 3	Merged content
Biochem/MCB 6761	Proteins and Macromolecular Structures	3	Biochem/MCB 761 and Biochem 766	3 + 3	Merged content
Mol Gen 5705	Advances in Cell Biology	2	Mol Gen 705	3	7 week course, same content
Mol Gen 5715	Developmental Genetics	2	Mol Gen 715	3	7 week course, same content
MCDB/OSBP 7600	First Year Student Orientation	1	OSBP 760	1	Enhanced content
MCDB 7780	MCDB Laboratory Rotations	4-6 (4 hours used for Summer)	MCDB 693	3	Credit hours increased to more accurately reflect time and effort. Repeatable to a max. 16 semester credit hr
MCDB 7890	Seminar in MCDB	1	MCDB 800	1	Same content. Repeatable. This course is graded S/U
MCDB 7891	MCDB Seminar Presentation	2	MCDB 890	2	Same content. Repeatable. This course is graded A-E
X 8999	Dissertation Research	1-12	X 999	1-18	No change. Repeatable. This course is graded S/U

ELECTIVES

Under the Semester system, students will take three electives (2 to 5 semester credits each) selected from courses at the 5000-level or above 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.

Under the Quarter system, students take three electives (3 to 5 credits each) from courses at the 500 level or above offered by the same departments.

