



Program Approval Form

For approval of new programs and deletions or modifications to an existing program.

Action Requested:

- Create New (SCHEV approval required except for minors)
- Inactivate Existing
- Modify Existing (check **ALL** that apply)
 - Title (SCHEV approval required except for minors)
 - Concentration (Choose one): Add Delete Modify
 - Degree Requirements
 - Admission Standards/ Application Requirements
 - Other Changes: _____

Type (Check one):

- B.A. B.S. Minor (req. C3 approval)
- M.A. M.S. M.Ed.
- Ph.D.
- Undergraduate Certificate* (req. C3 approval)
- Graduate Certificate*
- Bachelor's/Accelerated Master's Other:

College/School: Department:
 Submitted by: Ext: Email:

Effective Term: Please note: For students to be admitted to a new degree, minor, certificate or concentration, the program must be fully approved, entered into Banner, and published in the University Catalog.

Justification: (attach separate document if necessary)

Program Title: (Required)
 Title must identify subject matter. Do not include name of college/school/dept.

Concentration(s):

Admissions Standards / Application Requirements: (Required only if different from those listed in the University Catalog)

Degree Requirements:
 Consult University Catalog for models, attach separate document if necessary using track changes for modifications

Courses offered via distance:
 (if applicable)

TOTAL CREDITS REQUIRED:

Existing	New/Modified
Ph.D. in Biosciences	Ph.D. in Biosciences
Systematics, Molecular Evolution and Biocomplexity	Biocomplexity and Evolutionary Biology
NA	NA
See attached	See attached
NA	NA
72	72

*For Certificates Only: Indicate whether students are able to pursue on a Full-time basis Part-time basis

Approval Signatures

Required for Minors and Interdisciplinary Programs

In collaboration with another unit at Mason, the originating department must circulate this necessary signatures prior to submission. Failure to do so will delay action on this proposal.

Unit	Unit Approver's Signature	Date
School of Systems Biology	Kylene Kehn-Hall	6/16
Department of Biology	Larry Rockwood	

For Minors and UG Certificates only (Cross)

C3 Committee Member

Provost Office

C3 Committee Approval Date

For Graduate Programs Only

Graduate Council Member

Provost Office

Graduate Council Approval Date

For Registrar Office's Use Only: Received _____ Banner _____ Catalog _____

revised 7/1/15

Ph.D. Program in Biosciences

Course Work (48-60 credits)

Bioscience Core (12 credits)

BIOL 682-Advanced Eukaryotic Cell Biology Credits: 3

BIOS 703-Laboratory Rotation Credits: 3 (taken twice for a total of 6)

BIOS 704-Topics in Biosciences Credits: 1 (taken 3 times for a total of 3 credits)

Concentration in Biocomplexity and Evolutionary Biology (BEB)

Background:

This concentration prepares students for careers in academia, government or industry. Through this concentration students will learn laboratory and quantitative skills that will enable them to investigate evolutionary relationships among organisms at the population, species or ecosystem level. Students will be encouraged to explore a wide range of coursework in order to develop a broad background in evolutionary biology and a deep knowledge of relevant methodologies necessary to keep abreast in this rapidly changing field.

The science of evolutionary biology is fundamentally concerned with documenting not only genetic change, but also the processes that cause it. Evolutionary biology includes paleobiology, population genetics, evolutionary ecology and phylogenetics. Biocomplexity is the study of living organisms, including their unique structural, chemical and genetic properties, their distribution and abundance in nature, and their evolutionary relationships to all other organisms. Given the fact that most of the earth's biodiversity is unknown, collecting, cataloging and studying organisms have always been and will continue to be one of the most challenging aspects of biology.

Students take the following 12 credits of coursework:

BIOL 574: Population Genetics: 3 credits

BIOS 716: Methods in Evolutionary Biology: 4 credits (new course)

BIOS 767: Molecular Evolution Credits: 3 credits

BIOL 585: Eukaryotic Cell Biology Laboratory: 2 credits

24-36 hours of Elective Credits. Students select courses in consultation with their advisor and committee. Below is a list of suggested courses. However, students may take other courses related to their research topic if approved by their committee. Courses in Geographic Information Systems or Statistics are encouraged.

GEOL 501: Selected Topics in Modern Geology (Paleoclimatology/ Invertebrate Paleontology) Credits: 3
(may be repeated once)

GEOL 534: Vertebrate Paleontology Credits: 4

BIOL 506: Selected Topics in Microbiology Credits: 1-4

BIOL 507: Selected Topics in Ecology Credits: 0-4

BIOL 508: Selected Topics in Animal Biology Credits: 1-4

BIOS 715: Molecular Ecology (**new course**) Credits: 3

BIOL 518: Conservation Biology Credits: 3

BIOL 532: Animal Behavior Credits: 3

BIOL 533: Selected Topics in Plant Biology Credits: 1-4

EVPP 536: The Diversity of Fishes Credits: 3

BIOL 537: Ornithology Credits: 4

BIOL 538: Mammalogy Credits: 4

BIOL 539: Herpetology Credits: 4

BIOL 543: Tropical Ecosystems Credits: 4

BIOL 566: Advanced Topics in Microbial Physiology and Metabolism Credits: 3

BIOL 599: Fungi and Ecosystems Credits: 3

BIOL 561: Comparative Animal Physiology Credits: 3

BIOL 566: Cancer Genomics Credits: 3

BIOL 572: Human Genetics Credits: 3

BIOL 573: Developmental Genetics Credits: 3

BIOL 643: Microbial Ecology Credits: 4

BIOS 741: Genomics Credits: 3

BIOS 742: Biotechnology Credits: 3

BIOS 743: Genomics, Proteomics and Bioinformatics Credits: 3

BIOS 744: Molecular Genetics Credits: 3

BIOS 898 - Directed Studies in Biosciences

BIOS 899 - Directed Research in Biosciences

Dissertation Research (12-24 credits)

BIOS 998 - Doctoral Dissertation Proposal

BIOS 999 - Doctoral Dissertation Research

Concentration in Biocomplexity and Evolutionary Biology (BEB) within the Biosciences Ph.D. Program.

Justification

The original proposal for a Ph.D. in Biosciences, approved by SCHEV, contained several concentrations. One of these was a concentration in *Molecular Systematics and Evolution*. This approved concentration has not been active for some time. We hereby propose to activate this concentration and rename it: *Biocomplexity and Evolutionary Biology*. This concentration would be a joint venture between the Department of Biology and the School of Systems Biology (SSB). Between these two departments we can offer all of the coursework and research mentors necessary to support approximately ten new doctoral students per year. This number is based on a poll of the undergraduates in the Department of Biology, who number over 1300, and interviews with our collaborators at the Smithsonian Institution, who are already providing a steady stream of MS students, even though the new Biology MS concentration in *Evolutionary Biology* is only starting in fall of 2016. This concentration can begin to attract students immediately while needing no new resources. The Department of Biology can provide financial support for as many as 38 Ph.D. students through Graduate Teaching Assistantships, although some of these GTAs must be used to support Ph.D. students in Environmental Science and Policy. The Department of Biology current provides 23 GTA slots to SSB and these slots will continue to be given to students in concentrations other than the BEB concentration with the possibility of renegotiating if the number of GTA slots and/or PhD students increases. The Department of Biology is providing GTAs who are Ph.D. students with an additional \$3000 per year beyond what the College of Science pays. The additional money should help attract Ph.D. students to this concentration.

The concentration in Biocomplexity and Evolutionary Biology will attract a group of students to George Mason University, namely those interested in evolution and phylogenetics, that would otherwise look elsewhere, such as the University of Maryland, Georgetown, or George Washington, for example, for such a Ph.D. program. This concentration will provide existing faculty in the Department of Biology with a Ph.D program relevant to their academic interests, thereby enhancing and making more productive, their research programs. All of this can be done using existing courses and research labs with little additional cost.