Molecular Environmental Biology

Bachelor of Science (BS)

The Molecular Environmental Biology (MEB) major is designed to expose students to the organization and function of biological organisms. Molecular approaches are expected to play an increasing role in environmental problem-solving in the near future, and their success will depend upon a sound understanding of biological principles from molecular through ecological levels. The program trains students in the organization and function of biological organisms and their integration into the environment.

Declaring the Major

Advice on admission for freshmen and transfer students can be found on the CNR Admissions Guide (http://guide.berkeley.edu/undergraduate/colleges-schools/natural-resources/admissionstext) page or the CNR Prospective Student website (https://nature.berkeley.edu/prospective-students). Freshman students may apply directly to the major, or they may select the College of Natural Resources’s undeclared option and declare the major by the end of their fourth semester. Transfer students may apply directly to the major through the UC application.

Information for current Berkeley students who would like to declare the major after admission, including information on a change of major or change of college, please see chapter 6 of the College of Natural Resources Undergraduate Student Handbook (https://nature.berkeley.edu/handbook). [https://nature.berkeley.edu/handbook] Students can meet with peer advisors or academic advisors for full guidance.

- There is a 3.0 GPA requirement to transfer into the College of Natural Resources from other colleges on campus.
- Required pre-requisite courses to declare the Molecular Environmental Biology are: Chemistry 1A/L and 3A/L, one semester of Biology (1A/L or 1B), R1A and R1B, Math 1A/1B or 16A/B or 10A/B
  - It is recommended to complete the ESPM lower-division core courses.
- Undeclared students must declare a major by the end of their fourth semester. Failure to declare a major by junior standing will result in a registration block, and you will not be able to enroll in any courses until you are declared.
- Current UC Berkeley students who entered as freshmen are expected to be able to graduate in a total of 8 semesters (summers excluded). Exceptions are rarely granted. Students should be progressing in major requirements each semester.
- All major requirements must be taken for a letter grade.
- Both halves of the Reading and Composition requirement must be completed by the end of the fourth semester.

Honors Program

Students with a grade point average (GPA) of 3.6 or higher may enroll in the College of Natural Resources Honors Program (H196) once they have reached upper division standing. To fulfill the program requirements, students design, conduct, and report on an individual research project working with a faculty sponsor. For further information on registering for the Honors Symposium and on Honors requirements, please see the College of Natural Resources website (http://nature.berkeley.edu/site/honors_program.php).

Minor Program

There is no minor program in Molecular Environmental Biology.

Other Majors and Minors Offered by the Department of Environmental Science, Policy, and Management

Conservation and Resource Studies (http://guide.berkeley.edu/undergraduate/degree-programs/conservation-resource-studies) (Major and Minor)

Environmental Sciences (http://guide.berkeley.edu/undergraduate/degree-programs/environmental-sciences) (Major only)

Forestry and Natural Resources (http://guide.berkeley.edu/undergraduate/degree-programs/forestry-natural-resources) (Major and Minor)

Society and Environment (http://guide.berkeley.edu/undergraduate/degree-programs/society-environment) (Major only)

In addition to the University, campus, and college requirements, listed on the College Requirements tab, students must fulfill the below requirements specific to their major program.

Structure of the MEB Major

The lower division coursework provides a strong foundation in biological principles, and the upper division areas introduce students to the organization and function of biological organisms at the molecular, cellular, organismal, and ecological levels. The major also offers specialization through six Areas of Concentration: (1) animal health and behavior, (2) biodiversity, (3) ecology, (4) environmental and human health, (5) insect biology, and (6) global change biology.

**The curriculum has been revised effective Fall 2016. Students admitted prior to Fall 16 and following the previous curriculum should refer to the 15-16 (http://guide.berkeley.edu/archive/2015-16/undergraduate/degree-programs/molecular-environmental-biology/#majorrequirementstext) Guide.

Lower Division Requirements

Breadth Requirement

Select courses from L&S “7 Breadth” Categories (https://ls.berkeley.edu/seven-course-breadth-requirement)

# One course (3-4 units) in Arts & Literature, Historical Studies, or Philosophy & Values

# One course (3-4 units) in Social & Behavioral Sciences or International Studies

Reading & Composition Requirement

Students must complete Reading & Composition (http://guide.berkeley.edu/undergraduate/colleges-schools/letters-science/reading-composition-requirement) by the end of sophomore year.

ESPM Environmental Science Core

Select one of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV SCI 10</td>
<td>Introduction to Environmental Sciences</td>
<td>[3]</td>
</tr>
<tr>
<td>ESPM 2</td>
<td>The Biosphere</td>
<td>[3]</td>
</tr>
</tbody>
</table>
### Upper division Requirements

Select two courses from Area A and two courses from Area B. No more than one course from each category. Also complete the Senior Seminar (ESPM 192) and 12 units in Area of Concentration.

#### Area A

##### Biochemistry

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCELLBI 102</td>
<td>Survey of the Principles of Biochemistry and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 135</td>
<td>Chemical Biology</td>
<td>3</td>
</tr>
</tbody>
</table>

##### Molecular Biology/Genetics

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESPM 108B</td>
<td>Environmental Change Genetics</td>
<td>3</td>
</tr>
<tr>
<td>PLANTBI 160</td>
<td>Plant Molecular Genetics</td>
<td>3</td>
</tr>
<tr>
<td>MCELLBI 104</td>
<td>Genetics, Genomics, and Cell Biology</td>
<td>4</td>
</tr>
<tr>
<td>INTEGBI 141</td>
<td>Human Genetics</td>
<td>3</td>
</tr>
<tr>
<td>INTEGBI 161</td>
<td>Population and Evolutionary Genetics</td>
<td>4</td>
</tr>
<tr>
<td>INTEGBI 162</td>
<td>Ecological Genetics</td>
<td>4</td>
</tr>
<tr>
<td>INTEGBI 164</td>
<td>Human Genetics and Genomics (lab included)</td>
<td>4</td>
</tr>
<tr>
<td>MCELLBI 140</td>
<td>General Genetics</td>
<td>4</td>
</tr>
</tbody>
</table>

##### Cell & Developmental Biology

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCELLBI 130</td>
<td>Cell and Systems Biology</td>
<td>4</td>
</tr>
<tr>
<td>MCELLBI 133L</td>
<td>Physiology and Cell Biology Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>MCELLBI 141</td>
<td>Developmental Biology</td>
<td>4</td>
</tr>
<tr>
<td>MCELLBI 137L</td>
<td>Physical Biology of the Cell</td>
<td>3</td>
</tr>
<tr>
<td>PLANTBI C112</td>
<td>General Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>PLANTBI C109</td>
<td>Evolution and Ecology of Development</td>
<td>3</td>
</tr>
<tr>
<td>PLANTBI C112L</td>
<td>General Microbiology Laboratory</td>
<td>2</td>
</tr>
</tbody>
</table>

#### Area B

##### Organismal Physiology

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESPM 144</td>
<td>Insect Physiology</td>
<td>3</td>
</tr>
<tr>
<td>INTEGBI 132</td>
<td>Survey of Human Physiology</td>
<td>4</td>
</tr>
<tr>
<td>INTEGBI 140</td>
<td>Biology of Human Reproduction</td>
<td>4</td>
</tr>
<tr>
<td>INTEGBI 148</td>
<td>Comparative Animal Physiology</td>
<td>3</td>
</tr>
<tr>
<td>INTEGBI 150</td>
<td>Evolutionary Environmental Physiology</td>
<td>3</td>
</tr>
<tr>
<td>INTEGBI 151</td>
<td>Plant Physiological Ecology</td>
<td>4</td>
</tr>
<tr>
<td>INTEGBI 151L</td>
<td>Plant Physiological Ecology Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>MCELLBI 136</td>
<td>Physiology</td>
<td>4</td>
</tr>
<tr>
<td>NUSCTX 103</td>
<td>Nutrient Function and Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>PLANTBI/</td>
<td>Microbial Diversity</td>
<td>3</td>
</tr>
<tr>
<td>MCELLBI C116</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLANTBI 135</td>
<td>Physiology and Biochemistry of Plants</td>
<td>3</td>
</tr>
</tbody>
</table>

##### Organismal Diversity

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESPM 106</td>
<td>American Wildlife: Management and Policy in the 21st Century (lab included)</td>
<td>3</td>
</tr>
<tr>
<td>ESPM C105</td>
<td>Natural History Museums and Biodiversity Science</td>
<td>3</td>
</tr>
<tr>
<td>ESPM 108A</td>
<td>Trees: Taxonomy, Growth, and Structures (lab included)</td>
<td>3</td>
</tr>
<tr>
<td>ESPM 115B</td>
<td>Biology of Fungi with Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>ESPM C125</td>
<td>Biogeography</td>
<td>4</td>
</tr>
<tr>
<td>ESPM 132</td>
<td>Spider Biology (lab included)</td>
<td>4</td>
</tr>
<tr>
<td>ESPM C138/</td>
<td>Introduction to Comparative Virology</td>
<td>4</td>
</tr>
<tr>
<td>PLANTBI C114/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCELLBI C114</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESPM 140</td>
<td>General Entomology (lab included)</td>
<td>4</td>
</tr>
<tr>
<td>INTEGBI 102LF</td>
<td>Introduction to California Plant Life with Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>INTEGBI 103LF</td>
<td>Invertebrate Zoology with Laboratory</td>
<td>5</td>
</tr>
<tr>
<td>INTEGBI 104LF</td>
<td>Natural History of the Vertebrates with Laboratory</td>
<td>5</td>
</tr>
<tr>
<td>INTEGBI 168L</td>
<td>Systems of Vascular Plants with Laboratory</td>
<td>6</td>
</tr>
<tr>
<td>PLANTBI 113</td>
<td>California Mushrooms (lab included)</td>
<td>3</td>
</tr>
<tr>
<td>PLANTBI C110L</td>
<td>Biology of Fungi with Laboratory (lab included)</td>
<td>4</td>
</tr>
<tr>
<td>PLANTBI/</td>
<td>Microbial Diversity</td>
<td>3</td>
</tr>
<tr>
<td>MCELLBI C116</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLANTBI 120</td>
<td>Biology of Algae</td>
<td>4</td>
</tr>
<tr>
<td>&amp; 120L</td>
<td>and Laboratory for Biology of Algae</td>
<td></td>
</tr>
</tbody>
</table>

##### Ecology

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESPM 102A</td>
<td>Terrestrial Resource Ecology (lab included)</td>
<td>4</td>
</tr>
<tr>
<td>ESPM 111</td>
<td>Ecosystem Ecology</td>
<td>4</td>
</tr>
<tr>
<td>ESPM 112</td>
<td>Microbial Ecology</td>
<td>3</td>
</tr>
<tr>
<td>ESPM 112L</td>
<td>Microbial Ecology Lab</td>
<td>1</td>
</tr>
<tr>
<td>ESPM 113</td>
<td>Insect Ecology</td>
<td>3</td>
</tr>
<tr>
<td>ESPM 114</td>
<td>Wildlife Ecology</td>
<td>3</td>
</tr>
<tr>
<td>ESPM 115C</td>
<td>Fish Ecology (lab included)</td>
<td>3</td>
</tr>
<tr>
<td>ESPM 116B</td>
<td>Rangeland Ecology</td>
<td>3</td>
</tr>
<tr>
<td>ESPM 116C</td>
<td>Tropical Forest Ecology</td>
<td>3</td>
</tr>
<tr>
<td>ESPM C125</td>
<td>Biogeography</td>
<td>4</td>
</tr>
</tbody>
</table>
ESPM 131  Soil Microbial Ecology  3
ESPM 137  Landscape Ecology (Lab included)  3
ESPM/INTEGBI C149  Molecular Ecology  4
INTEGBI 153  Ecology  3
INTEGBI 154  Plant Ecology & 154L Plant Ecology Laboratory  5
INTEGBI 154L  Plant Ecology Laboratory  2
INTEGBI 157LF  Ecosystems of California  4
INTEGBI 159  The Living Planet: Impact of the Biosphere on the Earth System  3
INTEGBI 181L  Paleobotany - The 500-Million Year History of a Greening Planet  4

Senior Seminar recommended Fall of senior year
ESPM C192  Molecular Approaches to Environmental Problem Solving  2

Lab Requirement
Select two upper division courses which include a lab, as part of the Areas A or B or Area of Concentration requirements. Additionally, this requirement may be fulfilled by: (1) One 3-4 unit independent study lab (course numbered H196 or 199); Summer Forestry Field Camp; or the Moorea Field Study course.

Area of Concentration Requirement
Select 12 units from one concentration below. Up to four independent study units (e.g., ESPM 199, ESPM H196) may be applied to the concentration.

1. Animal Health & Behavior
ESPM C103/ INTEGBI C156  Principles of Conservation Biology  4
ESPM 106  American Wildlife: Management and Policy in the 21st Century (lab included)  3
ESPM 110  Primate Ecology  4
ESPM 114  Wildlife Ecology  3
ESPM C126/ INTEGBI C125  Animal Behavior  4
ESPM 142  Insect Behavior  3
ESPM 146L  Medical and Veterinary Entomology Laboratory  1
ESPM 186  Management and Conservation of Rangeland Ecosystems  4
ESPM 188  Case Histories in Wildlife Management  2
INTEGBI 104LF  Natural History of the Vertebrates with Laboratory  5
INTEGBI C143A/ PSYCH C113  Biological Clocks: Physiology and Behavior  3
INTEGBI C143B/ PSYCH C116  Hormones and Behavior  3
INTEGBI 146LF  Behavioral Ecology with Laboratory  5
INTEGBI 148  Comparative Animal Physiology  3
INTEGBI 184L  Morphology of the Vertebrate Skeleton with Laboratory  4
PSYCH 121  Animal Cognition  3

2. Biodiversity
ESPM C103/ INTEGBI C156  Principles of Conservation Biology  4
ESPM C105  Natural History Museums and Biodiversity Science  3
ESPM 106  American Wildlife: Management and Policy in the 21st Century (lab included)  3
ESPM 108A  Trees: Taxonomy, Growth, and Structures (lab included)  3
ESPM 115B  Biology of Aquatic Insects  2
ESPM C125  Biogeography  4
ESPM 132  Spider Biology (lab included)  4
ESPM 140  General Entomology (lab included)  4
ESPM 147  Field Entomology (“Ants,” “Beetles,” and “Spiders” (1 unit each) SP. All three courses must be completed to equal one “lab course”)  1
INTEGBI 102LF  Introduction to California Plant Life with Laboratory  4
INTEGBI 103LF  Invertebrate Zoology with Laboratory  5
INTEGBI 104LF  Natural History of the Vertebrates with Laboratory  5
INTEGBI 160  Evolution  4
INTEGBI 168 & 168L  Systematics of Vascular Plants and Systematics of Vascular Plants with Laboratory  6
INTEGBI 173LF  Mammalogy with Laboratory  5
INTEGBI 174LF  Ornithology with Laboratory  4
INTEGBI 175LF  Herpetology with Laboratory  4
INTEGBI 183L  Evolution of the Vertebrates with Laboratory  4
PLANTBI C110L  Biology of Fungi with Laboratory  4
PLANTBI 113  California Mushrooms  3
PLANTBI/ MCELLBI C116  Microbial Diversity  3
PLANTBI 120 & 120L  Biology of Algae and Laboratory for Biology of Algae  4

3. Ecology
ESPM 105A  Sierra Nevada Ecology  4
ESPM 102A  Terrestrial Resource Ecology  4
ESPM C103/ INTEGBI C156  Principles of Conservation Biology  4
ESPM 110  Primate Ecology  4
ESPM C104/ ENVECON C115  Modeling and Management of Biological Resources  4
ESPM 111  Ecosystem Ecology  4
ESPM 112  Microbial Ecology  3
ESPM 113  Insect Ecology  3
ESPM 114  Wildlife Ecology  3
ESPM 115B  Biology of Aquatic Insects  2
ESPM 115C  Fish Ecology  3
ESPM 116B  Rangeland Ecology  4
ESPM 116C  Tropical Forest Ecology  3
ESPM 117  Urban Garden Ecosystems  4
ESPM 118  Agricultural Ecology  4
ESPM 119  Chemical Ecology  2
ESPM C130/ GEOG C136  Terrestrial Hydrology  4
4. Environment & Human Health

ANTHRO 135 Paleoenobotany: Archaeological Methods and Laboratory Techniques (lab included)
ESP M 126 Animal Behavior
ESP M 138 Introduction to Comparative Virology
PLAN TBI 114/ MCELL B 114 Pesticide Chemistry and Toxicology
ESP M 148 Global Change Biology
ESP M 158 Biodiversity Conservation in Working Landscapes
ESP M/NUSCTX C159 Human Diet
ESP M 162 Bioethics and Society
ESP M 167 Environmental Health and Development
IN TEG B I 116 Medical Parasitology
IN TEG B I 117 Medical Ethnobotany
IN TEG B I 117L Medical Ethnobotany Laboratory
IN TEG B I 131 General Human Anatomy
IN TEG B I 131L General Human Anatomy Laboratory
IN TEG B I 137 Human Endocrinology
IN TEG B I 140 Biology of Human Reproduction
IN TEG B I C143A/ PSYCH C113 Biological Clocks: Physiology and Behavior
IN TEG B I C143B/ PSYCH C116 Hormones and Behavior
MCELL B 135A Topics in Cell and Developmental Biology: Molecular Endocrinology
MCELL B 150 Molecular Immunology
MCELL B 165 Neurobiology of Disease
NUSCTX 103 Nutrient Function and Metabolism
NUSCTX 108A Introduction and Application of Food Science
NUSCTX 110 Toxicology
NUSCTX 160 Metabolic Bases of Human Health and Diseases
NUSCTX 166 Nutrition in the Community
PLANT B I/ MCELL B I C103 Bacterial Pathogenesis
PLANT B I 180 Environmental Plant Biology
PB HLTH 103 Course Not Available
PB HLTH 104A Health Promotion in a College Setting
PB HLTH 105 Course Not Available
PB HLTH 116 Seminar on Social, Political, and Ethical Issues in Health and Medicine
PB HLTH 150B Introduction to Environmental Health Sciences
PSYCH 110 Introduction to Biological Psychology

5. Insect Biology/Arthropod Science

ESP M 140 General Entomology (ESP M 140 required for Insect Biology concentration.)
ESP M 105 Natural History Museums and Biodiversity Science
ESP M 113 Insect Ecology
ESP M 132 Spider Biology
ESP M 134 Fire, Insects, and Diseases in Forest Ecosystems
ESP M 142 Insect Behavior
ESP M 144 Insect Physiology
ESP M 147 Field Entomology
ESP M 148 Pesticide Chemistry and Toxicology
ESP M 172 Photogrammetry and Remote Sensing

6. Global Change Biology

CIV ENG 107 Climate Change Mitigation
ECON 102 Natural Resource Economics
ENE, RES 101 Ecology and Society
ENE, RES 102 Quantitative Aspects of Global Environmental Problems
EN VECON C175 The Economics of Climate Change
EPS 102 History and Evolution of Planet Earth
EPS 115 Stratigraphy and Earth History
ESP M 108B Environmental Change Genetics
ESP M 152 Global Change Biology
ESP M 167 Environmental Health and Development
ESP M 170 Carbon Cycle Dynamics
GEOG 142 Climate Dynamics
GEOG 143 Global Change Biogeochemistry
GEOG 139 Atmospheric Physics and Dynamics
IN TEG B I 154 Plant Ecology
IN TEG B I 154L Plant Ecology Laboratory
IN TEG B I 159 The Living Planet: Impact of the Biosphere on the Earth System
LD ARCH 110 Ecological Analysis
LD ARCH 110L Ecological Analysis Laboratory
LD ARCH C188 Geographic Information Systems
PLANT B I 122 Bioenergy
PLANT B I 180 Environmental Plant Biology
students complete their breadth courses in their first two years. Breadth courses are built into CNR major requirements and each major requires a different number of breadth courses and categories. The EEP major is the only CNR major that requires the entire 7 course breadth. Refer to the major snapshots on each CNR major page (https://nature.berkeley.edu/advising/majors-minors) for for additional information.

### High School Exam Credit


### Units Requirements

Students must complete at least 120 semester units of courses subject to certain guidelines:

- At least 36 units must be upper division courses, including a minimum of 15 units of upper division courses in the College of Natural Resources.
- A maximum of 16 units of Special Studies coursework (courses numbered 97, 98, 99, 197, 198, or 199) is allowed towards the 120 units; a maximum of four is allowed in a given semester.
- A maximum of 4 units of Physical Education from any school attended will count towards the 120 units.
- Students may receive unit credit for courses graded P (including P/ NP units taken through EAP) up to a limit of one-third of the total units taken and passed on the Berkeley campus at the time of graduation.

### Semester Unit Minimum

All CNR students must enroll in at least 13 units each fall and spring semester.

### Semester Unit Maximum

To request permission to take more than 19.5 units in a semester, please see the major adviser.

### Semester Limit

Students admitted as freshmen must graduate within 8 fall/spring semesters at UC Berkeley. Students admitted as transfer students must graduate within 4 fall/spring semesters at UC Berkeley. Students who go on EAP and UCDC can petition for additional semesters. Summer session, UC Extension and non-UC study abroad programs do not count towards this semester limit. Students approved for double majors or simultaneous degrees in two colleges may be granted an additional semester. CNR does not limit the number of total units a student can accrue.

### Senior Residence Requirement

After the term in which you achieve and exceed 90 units (senior status), you must complete at least 24 of the remaining 30 units in residence at the College of Natural Resources over at least 2 semesters. To count as residence, a semester must consist of at least 6 passed units taken as residence, a semester must consist of at least 6 passed units taken while the student is a member of CNR. At least one of the two terms must be a fall or spring semester. Senior residence terms do not need to be completed consecutively. All courses offered on campus for the fall, spring, and summer terms by Berkeley departments and programs and
all Berkeley online (‘W’) courses count. Inter-campus Visitor, Education Abroad Program, UC Berkeley Washington Program, and UC Berkeley Extension units do not count toward this requirement.

Students may use Summer Session to satisfy one semester of the Senior Residence Requirement, provided that four units of coursework are completed.

**Modified Senior Residence Requirement**

Participants in a fall, spring or summer UC Education Abroad Program (UCEAP), Berkeley Summer Abroad, or the UC Berkeley Washington Program may meet a modified Senior Residence Requirement by completing 24 of their final 60 semester units in residence (excluding UCEAP). At least 12 of these 24 units must be completed after senior status is reached. International travel study programs sponsored by Summer Sessions and education abroad programs offered outside of the UC system do not qualify for modified senior residence.

Most students automatically satisfy the residence requirement by attending classes here for four years. In general, there is no need to be concerned about this requirement, unless students go abroad for a semester or year or want to take courses at another institution or through University Extension during their senior year. In these cases, students should make an appointment to see an adviser to determine how they can meet the Senior Residence Requirement.

**Grade Requirements**

- A 2.0 UC GPA is required for graduation.
- A 2.0 average in all upper division courses required of the major program is required for graduation.
- A grade of at least C- is required in all courses for the major

**Mission**

Molecular Environmental Biology (MEB) focuses on biological organisms and the hierarchy of life, from molecules and genes through cells, organisms, communities and ecosystems. The breadth of this biological science program provides an important perspective for students who have a passion for biology and are interested in the application of biological principles to understand how organisms function in their environment. Also a pre-medical or pre-health science major, the discipline offers an array of six areas of concentration within biology: microbiology, animal health and behavior, insect biology, ecology, biodiversity, and environmental and human health.

**Learning Goals for the Major**

1. Holistic interdisciplinary thinking, that understanding the "big picture"
   a. Interdisciplinarity: The ability to understand and work across different disciplines
   b. Multiple processes: Recognition that biology and the environment involve multiple processes as do solutions to modern problems
   c. Interconnectedness: Understanding that biology and the environment are interconnected at many spatial, temporal, and hierarchical levels
   d. Global and international approaches: Appreciating that the environment is necessarily global in nature and solutions to problems require international approaches

2. Training in the hierarchy of biology
   a. Fundamentals of Science: Training in the cores areas of physics, chemistry, biology, and mathematics
   b. Quantitative skills: Necessary tools for addressing biological problems
   c. Biochemistry: An understanding of the fundamentals of biological chemistry including the properties of intermediary metabolites, the structure and function of biological macromolecules, and the logic of basis of genetics and gene expression
   d. Molecular biology/Genetics: The molecular biology of bacterial, archaeal and eukaryotic cells and their viruses, mechanisms of DNA replication, transcription, translation, nuclear and organellar genome structure and function and regulation of gene expression, heritability, measures of selection, etc.
   e. Cell and developmental biology: Cell structure and function, embryonic and post-embryonic development and growth, and gene expression
   f. Organismal physiology: Understanding of physiological function whether microbial, animal or plant, or comparison between different systems
   g. Organismal diversity: Emphasis on the nature of diversity whether plant, animal, fungus, protist, bacteria, or virus, the history of the lineages and life itself, and how diversity is distributed, global threats, etc.
   h. Ecology: The nature of interactions, biotic or abiotic, that dictate organismal distributions in space and time
   i. Laboratory experiences: Laboratory experiences allow students to gain hands-on experience in scientific approaches and methods
   j. Capstone seminar: The major ends with a senior seminar in Molecular Approaches to Environmental Problem-Solving. This course is highly interdisciplinary and is specifically intended to illustrate how all of the levels and approaches to biology are complementary and applicable to assessing or solving real-world problems especially as it relates to environmental issues

3. Analysis and application for students that choose the Animal Health & Behavior area of concentration
   a. Interaction of health and environment: Understanding how the environment, whether internal or external, affects organism health and behavior
   b. Expertise in health: Examination of the health of organisms from either physiological or environmental perspectives
   c. Epizootics: An appreciation of the potential for diseases in animal populations to spill over into humans as is the case in avian influenza or even the origins of HIV

4. Analysis and application for students that choose the Biodiversity area of concentration
   a. Biodiversity science: Detailed understanding of morphological and ecological diversity of a given organismic lineage
   b. Origins and evolution of life: Basic understanding of systematics and phylogenetics
   c. Quantifying biology: Knowledge of various sampling and species identification techniques to collect data
   d. Informatics: Proficiency in database development and management

5. Analysis and application for students that choose the Ecology area of concentration
   a. Principles of Ecology: Detailed understanding of ecological principles including energy flow, hydrologic, and mineral cycles, factors limiting species distribution and population size, and characteristics of species, populations, and communities
b. Ecological interactions: Interactions relevant to different organismic groups.

6. Analysis and application for students that choose the Environment & Human Health area of concentration.
b. Disease: Environmental epidemiology and the impacts of disease.

7. Analysis and application for students who choose the Insect Biology area of concentration.
a. Insects and biodiversity science: Understanding of major insects groups, relationships, and diversity.
b. Insects and environmental science: Knowledge of the impacts of insects (positive and negative) in the environment.

8. Analysis and application for students who choose the Microbiology area of concentration.
a. Microbiology expertise: Expertise and competence in processes, patterns in microbiology, and the role of microbes in ecosystem function.
c. Microbiology and the environment: Microbiology in environmental science, including impacts on human health & well-being.

9. Basic skills in research, analysis, communication.
a. Reading carefully: Ability to read for detail and comprehension.
b. Writing accurately: Ability to write succinctly, clearly, with coherence.
c. Thinking critically: Critical thinking through the exposure and synthesis of biological knowledge from courses and lab work.
d. Using theoretical and empirical knowledge: Ability to synthesize and apply information obtained through theory and observations.
e. Quantitative skills: Obtaining the quantitative skills necessary for the subdisciplines.
f. Analysis: Ability to perceive, tackle, and solve problems in environmental science.
g. Research experience: Research experience to practice scientific approaches and methods. Work with a faculty mentor while participating in an undergraduate research program or designing an individual research project. Share research results or work in progress in the form of a paper, report, research poster, or public presentation.
h. Communication: Strong communication skills, both written and verbal, to prepare for independent research work or team projects.

10. Lifetime skills.
a. Continuing appreciation for biological systems: To develop a passion for biology and its interconnections with the environment.
b. Representing science: To become an advocate for the training and knowledge of science, particularly the biological disciplines.

In the College of Natural Resources, we provide holistic, individual advising services to prospective and current students who are pursuing major and minors in our college. We assist with a range of topics including course selection, academic decision-making, achieving personal and academic goals, and maximizing the Berkeley experience.

If you are looking to explore your options, or you are ready to declare a major, double major, or minor, contact the undergraduate adviser for your intended major. Visit our website (https://nature.berkeley.edu/advising/meet-cnr-advisors) to explore all of our advising services.

Undergraduate Adviser, Molecular Environmental Biology
Elizabeth Storer  estorer@berkeley.edu  
260 Mulford Hall  510-642-1986