Collection Policy: ECOLOGY & EVOLUTIONARY BIOLOGY

1.0 TEACHING, RESEARCH AND EXTENSION PROGRAMS

1.1 Mission and emphases of the department

Ecology and evolutionary biology are two distinct but clearly overlapping disciplines. Ecology focuses on the performance of individual organisms in the context of their physical, chemical, and biotic environment, on the interactions among organisms (of the same and different species), and on processes at the ecosystem level. Evolutionary biology is concerned with patterns of change over time and space in the numbers and types of species, with the origin of novel form and function, and with explanations of these patterns in terms of descent with modification. E&EB is a basic science department, but many faculty members are concerned with how biology can be used to inform decisions in environmental, agricultural, and medical science. Understanding ecological principles is increasingly important in a world beset with climate change, habitat fragmentation, perturbation of nutrient flows, and species' extinctions. Evolutionary principles and methods of analysis are increasingly invoked in confronting a range of biological problems, from biodiversity conservation to emergence of new infectious diseases.

1.2 Faculty research

24 Tenure-track Faculty, 3 joint appointees, and 10-15 Research Associates and Postdoctoral Associates. We have defined four major areas of scholarship:

Biogeochemistry and ecosystem science
Community ecology and population biology
Organismal biology
Evolutionary biology

The following taxa are of interest:

Vertebrates

- Mammals
- Birds

Reptiles and amphibians
Fish
Invertebrates
Freshwater and marine invertebrates
Insects
Plants
Vascular plants
Algae
Bacteria and Viruses

1.3 Graduate program

Our graduate program includes 60-70 students, virtually all of whom are candidates for the Ph.D. degree. These students generally have the same intellectual and taxonomic interests as the faculty, although some work on problems and taxa outside the focal areas represented by the faculty.

1.4 Undergraduate program

E&EB does not have a separate major, but is part of the undergraduate Biology Major. There are 60-70 students in the E&EB Program of Study within the Biology Major. E&EB faculty teach a diversity of courses, with total enrollments of about 1500 students each year.

1.5 Extension activity

E&EB has no formal extension programs, but many of the faculty are involved in providing expert advice to the University, its alumni, the local community, and local, state, and federal organizations.

1.6 Noteworthy facilities *(e.g. unique classrooms, laboratories, farms, etc.)*

These include aquarium rooms, animal rooms for live vertebrates, greenhouses, plant growth chambers, woodworking and machine shops, computer facilities, and the teaching and laboratory facilities in Stimson Hall with its 6 laboratories for limnology, vertebrate, invertebrate and human biology courses. In addition, the Cornell University Museum of Vertebrates includes specimens of mammals, birds, fish, amphibians and reptiles, and related taxonomic and physiological data. Other facilities include field research sites such as local nature reserves and Cornell experimental ponds. The Department has close affiliations with The Laboratory of Ornithology in Sapsucker Woods, the Shoals Marine Laboratory, and the Paleontological Research Institute.

2.0 SUBJECT DESCRIPTION AND GUIDELINES

2.1 Subject definition

Faculty and students in E&EB are joined by common interests in the evolutionary process, in the ecological and geological context in which that process occurs, and in variation in performance ("fitness") among individual organisms in a temporally and spatially heterogeneous environment.

2.2 Subject scope

The following topics are collected at a Research level:

ECOLOGY OF PLANTS AND ANIMALS

Physiological/Functional Ecology

- Environmental adaptation
- Physiological ecology, especially water balance, energetics, and temperature regulation
- Host-recognition mechanisms
- Functional morphology and biomechanics

Population Ecology

- Population dynamics and regulation
- Competition, predation, mutualism and parasitism
- Models of population processes
- Ecology of invading species
- Conservation biology
- Life history theory and data on specific plants and animals

Community Ecology

- Community ecology of terrestrial and aquatic systems
- Marine littoral and reef communities.
- Marine ecology
- Limnology
- Models of community dynamics
- Community structure and dynamics
- Stream ecology
- Microbial ecology
- Plant-herbivore relations
- Plant-pathogen interactions,

- Chemical ecology
- Agricultural ecology, including nutrient dynamics in agroecosystems, intercropping, biological pest control and evolutionary processes in agriculture.
- Natural history of various locales
- The effects of climate of organisms and communities
- Species diversity and species interactions

Ecosystem and Global Ecology
- Biogeochemistry
- Biogeography
- Nutrient dynamics of terrestrial and aquatic ecosystems
- Impact of human activities on ecosystems, such as acid rain, global warming, oil spill
- Marine, terrestrial and arctic ecology
- Biological aspects of oceanography
- Models of ecosystem processes and responses of ecosystems to stress
- Landscape ecology

General
- General techniques of field ecology: observation, journal-keeping, sampling, use of scientific collections, dating methods

EVOLUTIONARY BIOLOGY
- Evolution of organisms, including insects, marine invertebrates, mammals, fishes, birds, amphibians, reptiles, plants, microbes (bacteria, viruses)
- Development and evolution
- Rates of evolution and diversification
- Ontogeny, phylogeny and heterochrony
- Evolutionary processes
- Hybrid zones
- Molecular evolution
- Models of evolutionary change in populations
- Coevolution
- Macroevolution and paleobiology
- Vertebrate and invertebrate paleontology
- Life history evolution
- Evolution of behavior
- Ecological genetics, including concepts of fitness, methods for measuring genetic variation and natural selection on ecologically important traits,

genetics of competitive ability and predator avoidance, character displacement, maintenance of genetic variability, limits to selection
- Systematics theory and Taxonomy
- History of evolutionary biology

2.3 Emerging trends in the subject area

The Department is currently developing a new "theme" - which is "ecological and evolutionary responses to environmental change." This theme ties together basic ecological and evolutionary principles with many of the pressing environmental issues that we face. We adopt a very broad definition of "environmental change," including but not restricted to global climate change. For example, our definition would certainly include how species respond when they are transported to new environments (either on their own or as a result of accidental or intentional introductions) or when they are subject to new selection pressures (pesticides, emerging diseases, increased or decreased nutrient availabilities, new competitors or predators). We emphasize that consideration must be given to both ecological (population dynamic, community structure, ecosystem function) and evolutionary (population genetic) responses, because both are essential to understand the long-term consequences of environmental change.

For purposes of envisioning the future of our disciplines, we have identified four integrative research areas that are likely to yield new and important insights over the next decade; they are also essential components of a broad program directed toward understanding responses to environmental change. The research areas are: (1) landscape and ecosystem ecology, (2) species interactions and disease ecology, (3) adaptation to new environments and (4) origin and maintenance of biodiversity: speciation, extinction and diversification.

3.0 SPECIAL INFORMATION NEEDS AND RESOURCES

3.1 Special information needs of those working in this subject area.

Faculty would like access to videotapes. Geographic Information Systems are potentially useful.
Databases used by this department on the Mann Gateway are BIOSIS, Web of Science, AGRICOLA, Wildlife & Ecology Studies Worldwide, and

Zoological Record. The department also uses several data-reporting web sites sponsored by governmental agencies and granting institutions.

3.2 Special collections or noteworthy resources in the field

3.3 Endowment funds or special funding arrangements

Burnham Endowment--botany
Mann--general biology
Sherman--microbiology
Wright--vertebrate biology
Clausen--treatises in biology
Raney—ichthyology
Shaw—plant science
Comstock—entomology
Rice—avian science
Claasen—entomology
Needham—entomology and ecology
Call—natural resources
Dukart—environmental science
Leonard—animal behavior
Regula—general biology

4.0 TYPES OF MATERIALS

4.1 Priorities for types of materials

Case studies and personal reminiscences in the field, unless of exceptional quality, are a low priority.

4.2 Format

4.3 Geographical guidelines

Interest is global, with selection generally at a country level. Regions for collecting are prioritized as follows: (1) U.S., Western Hemisphere, Neotropics, (2) Southeast Asia, Africa, (3) Middle East, Australia, (4) Europe.

4.4 Language guidelines

Conceptual materials are collected in English only. Factual materials, e.g., natural history, may also be collected in Spanish and Portuguese.

4.5 Chronological guidelines

Current for conceptual materials; historical coverage is necessary for systematics, conservation biology,
and some factual information.

5.0 OTHER RELATED LIBRARY COLLECTIONS

Engineering -- global mineral cycles, oceanography, except specifically biological aspects, paleontology, except specifically biological aspects, water analysis.
Olin -- history of biology and evolutionary thought (overlaps with Mann collection), archeology, physical anthropology.
Kroch -- older natural history
Entomology
Adelson Library of Ornithology
Bailey Hortorium
Veterinary -- morphology, development, vertebrate zoology (overlaps with Mann).
Physical Sciences -- extraterrestrial ecology.

6.0 POLICY QUESTIONS, COLLECTION NEEDS, FUNDING PROBLEMS OR OPPORTUNITIES

E&EB no longer has a real "presence" in human evolution or paleontology.
For Plant paleontology and paleobotany, the following faculty from Plant Biology should be consulted: Crepet, , Niklas , Nixon.
For shells, Mann should consult Drew Harvell, Jim Morin, and John Cisne.

7.0

PRINCIPAL LC CLASSES

QH 359-425
QH 540-549
QK 901-977
QL 1-739

8.0 RELATED COLLECTION POLICIES

- Population Studies -- population ecology of human beings.
- Crop and soil science -- soil ecology.
- Neurobiology and behavior -- overlaps with evolution of behavior.

- Molecular biology and genetics -- overlaps with evolution and genetic aspects of behavior. Genetics covers the evolution of protein and gene structures.
- Biological statistics
- Natural Resources
- Ornithology
- Plant Science
- Entomology

9.0 MATERIALS NOT COLLECTED BY MANN

- Statistical analysis programs
- Modeling and simulation programs
- Maritime studies: coastal and oceanic law and policy
- Nautical science: sailing, navigation, ships, physics of sailing
- Underwater archeology

Journals Where Faculty Most Frequently Publish

ECOLOGY
EVOLUTION
MOLECULAR PHYLOGENETICS AND EVOLUTION
JOURNAL OF EVOLUTIONARY BIOLOGY
SYSTEMATIC BIOLOGY
BIOLOGICAL JOURNAL OF THE LINNEAN SOCIETY
GENETICS
SCIENCE
PROCEEDINGS OF THE ROYAL SOCIETY OF LONDON SERIES B-BIOLOGICAL SCIENCES
ECOLOGY LETTERS
PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA
MOLECULAR ECOLOGY
NATURE
BIOSCIENCE
AMERICAN NATURALIST
CHEMICAL ECOLOGY
INTEGRATIVE AND COMPARATIVE BIOLOGY
TRENDS IN ECOLOGY & EVOLUTION
MANY DIFFERENT TAXONOMICALLY-ORIENTED JOURNALS, e.g., COPEIA, AUK, AMERICAN J. OF BOTANY, etc.

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February 19, 1993
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August 21, 1996
Revised by Linda Stewart, Rick Harrison
July, 2008