

RICHARD GILDER GRADUATE SCHOOL

CORE COURSES

Core courses give students a broad overview of the conceptual basis for studying life and to provide them with a common language and essential set of tools and methods for research. The annual organization, content, and flow of each core course will be developed by the course director (in consultation with the AMNH Comparative Biology Ph.D. Program Committee), who will oversee the implementation of the course throughout the semester. Course directors and faculty may vary, but teaching of all core courses will be done by faculty representing the broad spectrum of research disciplines of the AMNH.

Core Course: *Evolution*

Instructors: DeSalle, Flynn, Perkins, Siddall
4 credits (3 lecture + 1 discussion/lab)

This one-semester course will include historical and critical reviews of evolutionary theory and will cover the basic principles of contemporary evolutionary biology.

- **Section 1**—Evidence of evolution: the historical development of evolutionary biology; evolution in modern biology; evolution outside of biology
- **Section 2**—Basic principles of evolutionary biology: e.g., population and species concepts), fitness, adaptation, selection, species, clade, phylogeny, hierarchy, homology, and constraint.
- **Section 3**—Evolution of genes: population genetics; quantitative genetics; molecular evolution; molecular tools in evolutionary analyses.
- **Section 4**—Microevolution: fitness, natural selection, sexual selection, analysis of adaptation; nonadaptive causes of pattern, coevolution, complex adaptations.
- **Section 5**—Evolution of Development: molecular, cellular, and anatomical origin and transformation of form and function; developmental genetics, expression patterns, lineage analysis, and developmental analysis.
- **Section 6**—Macroevolution and major transitions in the history of life: speciation, cospeciation, tempo and mode in evolution, phyletic evolution in lineages, kin selection, clade dynamics, evolution of cells, and evolution of sex.
- **Section 7**—History of Life and the Earth: paleobiology, phylogenetic radiations, extinction, Earth history, tectonics, climate and environmental change, and interaction of biological and physical processes.

Student Evaluation: Evaluation in this course will consist of mid-term and final exams, in which students will be asked to answer a series of essay questions to demonstrate synthetic knowledge of the topics that are presented, as well as lab/discussion exams.

Core Course: *Systematics and Biogeography*

Instructors: Wheeler, Cracraft, Prendini
4 credits (3 lecture + 1 discussion/lab)

This one-semester class will explore the principles of systematics, the science of classifying organic diversity, contemporary systematic methods, and biogeography.

- **Section 1**—Introduction and background: history of systematics and classification, applications of systematics, schools of thought, and philosophical underpinnings of systematics.
- **Section 2**—Systematic data: homology, types of data, characters, weighting, and molecular data.
- **Section 3**—Analytical methods: alignment of nucleotide characters, inferring trees, distance algorithms, parsimony algorithms, likelihood, measures of support, consensus methods, optimization, and missing data.
- **Section 4**—History of biogeographic inquiry: dispersalist and vicariance perspectives, analytical methods in biogeography, and relation to conservation biology.
- **Section 5**—History and importance of classification; phylogenetic classification, applications of classifications, DNA “bar-coding,” and Assembling the Tree of Life initiatives.

Student Evaluation: Evaluation in this course will consist of mid-term exams and final exams, in which the students are asked to answer a series of essay questions to demonstrate synthetic knowledge of the topics that are presented.

Core Course: *Grantsmanship, Ethics, Communication*

Instructor: Norell and additional staff
3 credits

This course will be offered in a workshop format and focused on how scientists operate within the broader range of society.

- **Section 1**—Grantsmanship: preparing grants, identifying granting agencies, developing and maintaining grant budgets, and practical development of a grant application (e.g., Predoctoral Fellowship or Doctoral Dissertation Improvement Grant).
- **Section 2**—Ethical issues in science, including scientific misconduct, interpersonal responsibilities, institutional responsibilities, mentoring, peer review of papers and grants, serving on panels and boards, and use of animals in research.
- **Section 3**—Communication: writing quality papers, targeting papers to particular journals, crafting press releases, dealing with the media, and giving high-quality presentations.

Student Evaluation: This course will include AMNH faculty and speakers representing a spectrum of professions (foundation program directors, representatives from grants and development offices, journal and trade editors, publicists, science journalists, members of the legal profession, and compliance officers).