Uppsala University
SECOND SEMESTER
PANGEA TRACK/PROFILE: 1 - PALAEOBIOLOGY

TITLE OF UNIT: Principles of Palaeobiology

NUMBER of ECTS: 15

OPTIONAL or COMPULSORY (if applicable): Compulsory

PREREQUISITES (either in term of skills or knowledge or units to be validated before registration to this course): **120 credits with 90 credits in earth science or biology. English language proficiency that corresponds to English studies at upper secondary (high school) level in Sweden ("English 6").**

MODE OF TEACHING (distance education, webinar, workshops, seminars, lectures, supervised projects, etc): **Lectures, seminars, practices and field course.**

Number of hours dedicated to lectures, practices, field-excursions, etc: **400 hours, including personal workload**

Personal workload (hours expected to be dedicated to, including supervised projects): **400 hours, including number of hours dedicated to lectures**

Description of the course

General aims

On completion of the course, the student should be able to:

- discuss the principles of the nature of the fossil record, fossil preservation including exceptional preservation, phylogeny, evolution and classification from a palaeontological perspective
- identify the major invertebrate fossil groups
- reconstruct the environment and ecology of selected invertebrate groups both in the laboratory and the field
- describe and evaluate the ecology of a field collection of fossils including the use of appropriate photographic, preparatory and microscopy techniques
- assess selected controversies in palaeobiology by reference to the scientific literature

Expected outcomes (knowledge)

- Introductory knowledge of major fossil groups and their evolutionary history.
- Major influences on the normal and exceptional preservation of fossils.
- Major extinction events and their possible causes.
- Major controls on the ecological distribution of living and fossil organisms.
- Principles of cladistic analysis.
- The structure of modern marine ecology and the equivalent for fossil organisms.

Expected outcomes (skills)

- Analyze fossils in terms of their environment of deposition and preservation in order to generate a taphonomic history.
- Assess fossil assemblages in order to describe ecological interactions and to reconstruct the palaeoenvironment of the fossil deposit, again in the lab and field.
- Compare and contrast microevolutionary processes with macroevolutionary processes in the context of the major events in Earth history.
- Apply the principles of cladistic analysis to a simple fossil database to create a phylogenetic analysis.
- Use the principles governing the distribution of modern organisms to explain the distribution of fossils in time and space.
- Infer autecology of an organism based on its morphology and apply this to fossils.

Content summary

- Nature of the fossil record.
- Principles of palaeobiology and evolution.
- Classification and phylogeny.
- Evolution and the fossil record.
- Palaeoecology.
- Current topics in palaeobiology.
- Practical work with fossils.

Person in charge of the unit (first and last name, e-mail)
Director of study Mikael Höök, mikael.hook@geo.uu.se

EVALUATION MODE	Ratio of the final grade
Written examination	**7.5 credits**
Practicals and field course	**2.5 credits**
Active participation in seminars	**2.5 credits**
Written essay	**2.5 credits**

TITLE OF UNIT: Evolution and Development

NUMBER of ECTS: 15

OPTIONAL or COMPULSORY (if applicable): **Compulsory**

PREREQUISITES (either in term of skills or knowledge or units to be validated before registration to this course): **150 credits including (1) 60 credits in biology and 30 credits in chemistry or 30 credits in earth science, or (2) 90 credits in biology, or (3) 60 credits in earth science, including Principles of Palaeobiology, 15 credits. English language proficiency that corresponds to English studies at upper secondary (high school) level in Sweden ("English 6").**

MODE OF TEACHING (distance education, webinar, workshops, seminars, lectures, supervised projects, etc): **Teaching includes lectures, seminars and laboratory practicals.**

Number of hours dedicated to lectures, practicals, field-excursions, etc: **400 hours, including personal workload**

Personal workload (hours expected to be dedicated to, including supervised projects): **400 hours, including number of hours dedicated to lectures**

Description of the course

General aims

The general aim of the course is to illustrate the interactions between molecular patterning, ontogeny and morphology in an evolutionary perspective. These interactions are studied in detail in selected examples from invertebrates and vertebrates.

On completion of the course, the student should be able to:

- explain how genomic, developmental biological, morphological and palaeontological data can be connected in a phylogenetic framework to illustrate macroevolutionary issues
- use basic genomic and developmental biological concepts such as paralogy, orthology, gene expression, cell populations and "cell fate choice"
- account for the detailed morphological structure and evolution of the examples that are discussed during the course
- review and evaluate scientific papers critically
- present research results based on critical evaluation of scientific papers
- identify and discuss ethical aspects related to animal testing.

Expected outcomes (knowledge):

- explain how genomic, developmental biological, morphological and palaeontological data can be connected in a phylogenetic framework to illustrate macroevolutionary issues
- use basic genomic and developmental biological concepts such as paralogy, orthology, gene expression, cell populations and "cell fate choice"

- account for the detailed morphological structure and evolution of the examples that are discussed during the course

Expected outcomes (skills)

- review and evaluate scientific papers critically
- present research results based on critical evaluation of scientific papers
- identify and discuss ethical aspects related to animal testing.

Content summary

The course includes examples from invertebrates and vertebrates, as well as an overview of underlying common principles. We study among others the common body plan and patterning of bilaterians, the evolution of the head and the origin and evolution of paired extremities in vertebrates and arthropods. We discuss these questions in a genomic, developmental biological, morphological and palaeontological perspective, within a phylogenetic framework where questions as character polarity are taken into consideration.

Person in charge of the unit (first and last name, e-mail)
Study counsellor, Earth Sciences, studycounsellor@geo.uu.se

EVALUATION MODE	Ratio of the final grade
Theory	**10 credits**
Seminars	**2 credits**
Laboratory session	**3 credits**