Universitat Autònoma de Barcelona

**2018/2019**

# Continental Paleobiology

Code: 43860
ECTS Credits: 15

| Degree | Type | Year | Semester |
|---|---|---|---|
| 4316238 Paleobiology and Fossil Record | OT | 0 | A |

## Contact

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## Use of languages

Principal working language: english (eng)

## Teachers

Ángel Galobart Lorente
David Martinez Alba
Salvador Moyà Solà
Albert Garcia Selles
Judit Marigó Cortés
Xavier Delclos Martinez
Raef Minwer-Barakat
Daniel de Miguel
Carles Martin Closas
Marc Furio Bruno
Bernat Vila Ginesti
Isaac Casanovas Vilar
Joan Madurell Malapeira
José María Robles Giménez
Josep Fortuny Terricabras
Arnau Bolet Mercadal
Angel Hernandez Lujan

## External teachers

Albert Prieto Márquez

## Prerequisites

There are no pre-requirements.

## Objectives and Contextualisation

This module provides a deep view in the evolution and diversity of continental biotas along the geological time.

It is divided in four different topics (Paleobotany, Paleoherpetology, Paleomammalogy and Paleoprimatology and Human Evolution) combining the classical hypothesis with the most recent discoveries and updated theories in the evolutionary history of plants, dinosaurs and primates.

The students are expected to acquire an updated view of the evolution of the continental ecosystems during the most significant moments of the last 350 milion years.

## Skills

- Analyze data using adequate mathematical tools.
- Apply evolutionary concepts to resolve geological problems related to the time-ordering of fossils and the sediments that contain them.
- Bring the necessary paeontological knowledge for the geology of exploration to the georesources exploitation industry.
- Communicate and justify conclusions clearly and unambiguously to both specialised and non-specialised audiences.
- Continue the learning process, to a large extent autonomously.
- Design and carry out research projects in paleobiology and communicate and disseminate the results of the knowledge acquired.
- Gather and synthesize information from scientific literature (library, data bases, online journals, contrasted web pages).
- Obtain original data by means of field or lab work and process them adequately to resolve questions of a paleobiological profile.
- Recognize and use the fossil record applying the theories, paradigms and concepts of evolution and ecology to resolve specific problems of life in the past.
- Show a critical and self-critical capacity.
- Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
- Use a scientific argument in English to justify research results .
- Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
- Use paleontological, geological, biological, chemical or physical sources of information to delimit ecological parameters in the past.

## Learning outcomes

1. Analyze data using adequate mathematical tools.
2. Apply information from the plant fossil register to solve paleoenvironmental problems (paleoclimatic, paleoecological).
3. Apply knowledge of applied anatomy, functional morphology and biomechanics to analyse the biological aspects of vertebrates in the past.
4. Apply knowledge of comparative anatomy, phylogeny, taxonomy and ecology to make an adequate analysis of the evolution of vertebrates over time.
5. Apply the appropriate methodology for the study of each type of plant remain.
6. Apply the appropriate methodology for the study of fossil vertebrates.
7. Apply the theories, paradigms and concepts of geology to gain an adequate and global vision of the evolution of vertebrates over time.
8. Carry out a climatic analysis from a pollen analysis from the Quaternary.
9. Carry out a paleontological study of the plant fossil register and its paleoenvironmental implications.
10. Communicate and justify conclusions clearly and unambiguously to both specialised and non-specialised audiences.
11. Continue the learning process, to a large extent autonomously.
12. Control the different field methodologies for the collection of vertebrate fossil remains.
13. Control the different laboratory methodologies for the study of vertebrate fossil remains.
14. Gather and synthesize information from scientific literature (library, data bases, online journals, contrasted web pages).

15. Identify the main groups of living organisms represented in the continental fossil register.
16. Integrate fossil remains and associated animals in the same paleoenvironmental analysis.
17. Know the interactions between plants and insects in the fossil register.
18. Know the main groups of vascular plant fossils from their different organs (be familiar with the use of parataxonomy).
19. Propose hypotheses about the habitat of a plant from sedimentological and taphonomic analysis.
20. Recognise and make adequate use of the fossil register for solve specific problems in the areas of evolution of vertebrates.
21. Recognise and make adequate use of the fossil register for vertebrates in the area of paleobiology.
22. Recognise plant fossil remains (pollen and macroremains) which may help with a correlation of geological units and characterise depositional environments in hydrocarbon and carbon prospecting.
23. Relate a plant association with its chronostratigraphic context.
24. Relate a vertebrate fossil association with its chronostratigraphic context.
25. Relate concepts in the area of paleobiology and evolution of vertebrates and disseminate the results.
26. Relate concepts in the area of taxonomy, phylogeny and the evolution of fossil vertebrates and disseminate the results.
27. Show a critical and self-critical capacity.
28. Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
29. Understand the ethological information provided by vertebrate traces.
30. Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
31. Use scientific argumentation to justify the results of research.

## Content

**Paleobotany.** Origin and initial development of vascular plants and their colonization of terrestrial environments. Origin and development of seed plants. Angiosperms in the Upper Cretaceous. Application of angiosperms in the paleoclimatic reconstruction of the Cenozoic. Relationships and coevolutionary processes between plants and arthropods. Applications in georesources (characterization of coals etc.).

**Paleoherpetology.** Origin, evolution, systematics and paleobiology of reptiles. Origin and diversification during the Mesozoic (dinosaurs, pterosaurs and large marine reptiles). Evolutionary radiation and origin of the main groups of current tetrapods (mammals, archosaurs and birds).

**Paleomammalogy.** Origin and evolutionary radiation of mammals after the great dinosaur extinction. Diversity of form and size in the main placental orders of the Cenozoic. Anatomical adaptations to displacements and diets, and their relationship with environmental and climatic changes during the Tertiary and Quaternary.

**Paleoprimatology and Paleoanthropology.** Origin and adaptations of primates. Evolutionary history of the order Primates from their beginnings and related groups to the origin of modern humans. Characteristics and evolution of groups: plesiadapiforms, Eocene "prosimians", strepsirrhines and anthropoids. Origin, evolution and paleobiology of hominoids and the use of ancient DNA. Specific adaptations and appearance of the genus *Homo*.

## Methodology

Lectures and Seminars

Practical classes

Learning based in problems

Reading of Scientific Papers and Books

Written Work

## Activities

| Title | Hours | ECTS | Learning outcomes |
|---|---|---|---|
| **Type: Directed** | | | |
| Lecture | 80 | 3.2 | 4, 5, 6, 7, 12, 15, 17, 18, 19, 21, 24 |
| Practical classes | 20 | 0.8 | 1, 2, 3, 4, 5, 6, 8, 11, 12, 13, 15, 16, 18, 19, 21, 23, 29 |
| **Type: Supervised** | | | |
| Field Work | 15 | 0.6 | 2, 5, 9, 16, 17, 18, 19, 22, 23, 24 |
| Learning based in problems | 60 | 2.4 | 1, 2, 4, 7, 10, 11, 14, 16, 20, 23, 24, 25, 26, 27, 28, 30, 31 |
| Written Works | 89 | 3.56 | 7, 9, 10, 11, 14, 16, 21, 23, 24, 25, 26, 31 |
| **Type: Autonomous** | | | |
| Reading of Scientific Papers and Books | 85 | 3.4 | 1, 11, 14, 27, 31 |

## Evaluation

Attending and Participation in Classes

Written Works

Exercises in class

Exams

## Evaluation activities

| Title | Weighting | Hours | ECTS | Learning outcomes |
|---|---|---|---|---|
| Attending and Participation in Classes | 10% | 0 | 0 | 5, 6, 10, 11, 12, 13, 19, 21, 22, 27, 31 |
| Exams | 40% | 8 | 0.32 | 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 29 |
| Exercises in class | 30% | 10 | 0.4 | 1, 3, 4, 5, 6, 7, 10, 11, 12, 13, 14, 16, 20, 22, 23, 24, 25, 26, 27, 28, 30, 31 |
| Written Works | 20% | 8 | 0.32 | 10, 11, 14, 15, 16, 23, 24, 25, 26, 27, 28, 29, 31 |

## Bibliography

The most relevant bibliographic references will be provided by each professor at the end of the lesson.