UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

# SYLLABUS DEL CORSO

# Geobiology

**2526-1-F7402Q024**

## Aims

Knowledge and understanding
Students will develop an advanced understanding of the interactions and coevolution between biosphere, hydrosphere and geosphere, with particular attention to marine systems. They will acquire knowledge of the major extinction events in Earth's history, the origin and evolution of organic calcification and biomineralisation processes, the evolution of bioconstructor associations throughout the Phanerozoic, and the distribution of present-day bioconstructions. They will understand the role of geological drivers in shaping the marine biotopes, and their sensitivity to the ongoing climate change. Students will also gain insights into photosynthesis and chemosynthesis and their role in the evolution of life and in the present-day trophic webs, and will be introduced to the relationship between ocean chemistry, biomineralisation, and biogeochemical proxies.

Applying knowledge and understanding
Students will be able to recognise, analyse, and describe bioconstructions and benthic associations, assessing their spatial and temporal distribution and linking them to the evolution of marine environments. They will apply actualistic approaches, using modern benthic communities and their zonation as keys for interpreting the palaeoenvironments of the recent geological past. Furthermore, students will acquire the ability to evaluate chemical processes at the water–sediment interface and to employ biogeochemical proxies and natural archives to reconstruct past environmental changes and to assess ongoing global change and the role of the oceans within it.

## Contents

Coevolution of geosphere and biosphere, extinctions, bioconstruction and habitat engineers, sediments and benthos, benthic zonation, principles of biomineralization, introductory biogeochemistry and proxy data in natural archives, geosciences for the interpretation and reconstruction of the ecological history of coastal environments, past and ongoing global changes.

## Detailed program

Lessons: Extinctions and major events in the Earth history. The appearance of organic calcification and the biomineralization. Photosynthesis and chemosynthesis. Ocean chemistry and biomineralization. The evolution of biogenic builders in the Phanerozoic. The modern bioconstruction: structures, biological associations, ecological factors of control and distribution. Habitat engineers. Diagnosis, significance and distribution of the major benthic associations and related sediments. Biocoenoses, communities, associations and benthic zonation in the present-day oceans as model for the interpretation of recent past environments. The chemical environment at the water-sediment interface. Identification and interpretation of the most important ichnofacies. Biogeochemical proxies and natural archives. The ongoing global change and the role of the oceans.

Practical classes: Geobiological analyses of biogenic remains and embedding sediments, in the framework of the marine benthic bionomics. Observations under Scanning Electron Microscope (SEM) of the commonest shell/skeletal structures.

Lab activities (for Geology students): carbonate rocks and carbonate factories, classifications, components, processes and environments of formation. Identification of components in thin section under Optical microscope..

## Prerequisites

Fundamentals of Marine Biology, Ecology and Physical geography, or General Palaeontology

## Teaching form

- 17 two-hours + 1 hour lectures, in person, Delivered didactics (35 hours, 5 cfu)
- 4 three-hours practical classes, in person, Interactive Teaching. Mandatory attendance for at least 2/3 of the total hours to access the exam.
- Geology students only: 8 three-hours lab activities, in person, Interactive Teaching. Mandatory attendance for at least 2/3 of the total hours of lab + practicals to access the exam.

## Textbook and teaching resource

The lectures and some suggested readings will be provided by the teacher.

Useful books: Fundamentals of Geobiology, Knoll et al (Eds) ISBN 978-1-4051-8752-7

## Semester

First semester

## Assessment method

Written + Oral examination

A written test of 20 questions will test the understanding of the main concepts presented during the course.
A supplementary preliminary question, exclusively for the students of Geological Sciences who select this course, is aimed at assessing their knowledge of the main subdivision of the geological time. A negative result for this first question prevents the continuation of the exam (for geologists only).

The final mark is composed by the written/oral marks plus up to 1 point for the practicals. If the compulsory attendance for at least 2/3 of the laboratory hours is not respected, it will not be possible to take the oral exam.

Marks are given as n/30. Minimum positive value is 18/30

## Office hours

To make an appointment, please contact me by mail: daniela.basso@unimib.it

## Sustainable Development Goals

QUALITY EDUCATION | LIFE BELOW WATER