

PROPOSITIONS POUR TRAVAUX DE BACHELOR

Prof. Jean-Pierre Berger

1. La Molasse du Jura

De nombreux affleurements et forages nouveaux ont été découverts (et sont toujours en cours) dans les divers synclinaux molassiques du Jura. L'étudiant pourra se familiariser avec une région, et faire une première synthèse géologique, stratigraphique, paléontologique à partir du matériel déjà récolté et de nouvelles fouilles.

Les domaines de recherches sont variés (sédimentologie, paléontologie, géologie régionale,...) avec toujours le même but : reconstituer les paléoenvironnements (paléoclimat, paléoécologie, paléogéographie) d'une région à une époque donnée.

Une collaboration avec les bureaux de géologues est prévue.

Ce travail se fait en étroite collaboration avec la Section de Paléontologie du Jura (et notamment Damien Becker). Il pourrait déboucher sur un travail de Master.

Plusieurs personnes peuvent travailler en même temps.

2. Géotopes d'importance nationale

L'inventaire des géotopes (sites géologiques sens large, incluant paléontologie, minéralogie, etc.) d'importance nationale est actuellement en cours. L'étudiant pourra étudier la valeur scientifique de l'un ou l'autre de ces géotopes, afin de compléter au maximum et de manière exhaustive la valeur scientifique de ce (ces) géotopes.

Un travail de terrain (reconnaissance) et de labo (nouvelles analyses) est prévu.

Enfin, l'étudiant pourra proposer des mesures de protection et/ou de valorisation du site.

2-3 personnes

3. Fossiles du Jura

Divers projets liés à la section de Paléontologie dans le Jurassique, le Tertiaire et le Quaternaire sont en cours dans le Jura. Des propositions plus détaillées seront faites selon l'intérêt des étudiants.

Plusieurs personnes peuvent travailler en même temps.

PROPOSITIONS POUR TRAVAUX DE MASTER

SEDIMENTOLOGIE

Prof. André Strasser

1. Palaeoenvironmental evolution of the Jura platform in the Oxfordian

Based on detailed mapping and logging of sections in the region of Balsthal, the palaeoenvironmental conditions reigning in shallow carbonate lagoons are reconstructed (climatic and sea-level changes, ecology of carbonate-producing organisms). The time-frame is given by high-resolution sequence stratigraphy and cyclostratigraphy.

Methods: fieldwork, microfacies analysis.
One MSc student.

2. Evolution of a carbonate ramp in the Priabonian of the Helvetic nappes:

In the Priabonian, a carbonate ramp developed directly on the Cretaceous substratum. Red algae and nummulites point to temperate-water conditions; corals occur only locally. Excellent outcrops are found in the region of the Sanetsch pass. The influence of sea-level changes and synsedimentary tectonics on these depositional environments will be evaluated, and the climatic history reconstructed.

Methods: fieldwork, microfacies analysis.
One MSc student in collaboration with a PhD student and other MSc students.

MINERALOGIE

Prof. Bernard Grobéty

1. Insulating properties of CaTiO₃

Project: The mineral perovskite CaTiO₃, which gave its name to the structure type, is also used as compound in many applications, such as photoluminescent material or as substrate for biomaterials. Based on the high infrared reflectance we are testing CaTiO₃ as potential insulating coating. For such an application, large quantities of CaTiO₃ are needed. The simplest way to synthesize CaTiO₃ is by heating equimolar mixture of CaCO₃ and TiO₂. Goal of the Master project is to investigate the mechanism and kinetics of the reaction, and to study the influence of grain size (milling activation) and doping (REE) on the synthesis.

- Methodology: -Synthesis in high-temperature furnace
-In-situ high-temperature X-ray diffractometry
-SEM and conventional X-ray analysis
- 1 Student
- Collaboration: Prof. Bernhard group in the Physics Department

2. Kinetics of chlorite dehydration

Project: The chlorite structure differs from other phyllosilicate structure by the presence of an additional "naked" octahedral layer. Dehydration under ambient conditions is complex due to the presence of two different types of OH-groups and the variable composition of chlorite. Question which arises are: Do both octahedral layers dehydrate simultaneously; what structure have, if present, the intermediate phases etc. The dehydration mechanisms and kinetics will be analyzed by conventional and in-situ high temperature powder X-ray diffractometry.

- Methodology: -In-situ high-temperature X-ray diffractometry
-SEM and conventional X-ray analysis
- 1 Student

3. Thermal transformation of amphibole asbestos

Project: Thermal annealing has been proposed to transform asbestos fibers into inoffensive phases (f.ex. Dellisanti et al. 2002; Mattenklott, 2004). However, little information on the transformation kinetics of asbestos materials within these materials, nor on the influence of the heating parameters (gradients, time, max. temperature) is known. Analysis of the dehydration stoichiometry and kinetics of pure and cement-matrix bound crocylolite and amosite will be performed by in-situ high temperature powder X-ray diffractometry.

⇒ Collaboration: Dr. M. Schafer, CARBOTEC

4. Field-related projects in crystalline and metamorphic geology

It is also possible to do a field-related Master project in crystalline/ metamorphic geology. Field areas are located within the contact aureole of the Adamello intrusion (Northern Italy).

MICROPALEONTOLOGIE

Dr. Silvia Spezzaferri

1. Micropaleontology benthic foraminifera from cold-water coral ecosystems to investigate their response to environmental conditions

The work implies the study of benthic and planktonic foraminifera collected from cold-water ecosystems in the North Atlantic especially along the Norwegian margin. The study is complemented by geochemical analyses and in particular measures of phosphorus content in the sediments

Methods: laboratory work, geochemical analyses, possibly short oceanographic cruises, The research will be performed with the co-operation of Dr. Federica Tamburini (ETH-Zurich).

One to two students, possibility of publication of results after the completion of the research.

2. Marine geology and micropaleontology content of mud breccia from mud volcano in the Alboran Sea

The study implies the micropaleontological investigation of the microfauna (benthic and planktonic foraminifera) from the Carmen mud volcano discovered in the Alboran Sea. The purpose is to identify possible seepage related to the mud volcano in a geological context and investigate a possible relation with the benthic foraminifera.

Methods: laboratory work, geochemical analyses

One student, possibility of publication of results after the completion of the research.

PALEONTOLOGIE

Prof. Jean-Pierre Berger

The Master studies proposed under my direction deal with paleontology and/or molasse deposits. Other possibilities are open, according to proposals coming from the students.

Hereby some examples.

1. The Jura Molasse

A lot of new Tertiary outcrops and boreholes have been (and are still currently) discovered in the Jura synclines. The candidates will have the opportunity to study these outcrops, which are still unknown (often covered by quaternary). Fossil localities, as well as tectonic and sedimentary studies will be available.

In collaboration with the Section de paléontologie du Jura (Paleojura).

Methods: macro and micropaleontology, sedimentology, clay and/or heavy minerals. The student could also propose his choice concerning a deeper study of a paleontological group (mammals, fishes, bivalves, forams, ostracods...).

The principal goal of this study is to reconstruct the paleoecology, paleoclimates and paleogeography of the studied area during the Oligo-Miocene.

Moreover contacts with geological companies will be possible, to make a first contact with the practice (hydrogeology, geotechnical).

1 to 3 students

2. The Karst of Glovelier

The karst of Glovelier is a fossil-rich locality dated from Burdigalian (mammals, forams, sharks, other fishes and reworked invertebrates fossils from the Jurassic). This is the unique dated-karst of this age in Switzerland, and its represent the only dated point of the north coast of the Upper marine Molasse (OMM).

The valorisation of this site as a national Geotope will be also discussed.

Methods: macro and micropaleontology, sedimentology, clay and/or heavy minerals. The student could also propose his choice concerning a deeper study of a paleontological group.

1 student.

3. Geotopes of national Importance

The inventory of the Geotopes (geological sites, including paleontology, mineralogy, etc) of national importance is currently in preparation. The student will be able to study the scientific value of some of these geotopes, to complete precisely the scientific value of these sites.

Field work as well as lab (new analyses) will be proposed.

The student will have also the possibility to propose some scenarios to protect and/or to manage these sites for tourism and education.

1-3 students

4. The Molasse between Geneva and Savoie

This part of the Molasse was studied during the 80' and need an update. New outcrops have been discovered and are not yet studied. A mammal site is also known from this area.

Methods: macro and micropaleontology, sedimentology, clay and /or heavy minerals. The student could also propose his choice concerning a deeper study of a paleontological group (mammals, fishes, bivalves, forams, ostracods...).

1 student

5. Cenozoic Turtles

The rests of Turtles are numerous in the Molasse, but no recent study was devoted to them. The student will have as a task to find the fossils and sites with turtles of the Swiss Molasse and to analyse it in collaboration with specialists. Isotopic studies are also planified. The comparison with living species will be discussed. The goal of this study will be to understand the evolution of the Turtles during the Oligo-Miocene in Europe, based on Swiss material.

1 student

6. Mesozoic Turtles

Very rich fossil associations of Turtles have been (and are still) found in the Kimmeridgian of the Jura Mountains, but no recent study was devoted to them. The student will have as a task to to analyse it in collaboration with specialists. Isotopic studies are also planified. The comparison with living species will be discussed.

The goal of this study will be to understand the evolution of the Turtles during the Jurassic in Europe, based on Swiss material.

1 student.