

C. Palaeoceanography

C.1. Master track: BIOGEOLOGY

Utrecht University, Faculties: Geosciences (coordination) & Science (Biology).
Level: 400/500; ECT's: 120; Coord.: Prof. Dr. G.J. van der Zwaan (Geosciences)

Websites:

<http://www.geo.uu.nl/homegeosciences/studying/programmesinengl/mscprogrammes/mscearthsciences/biogeology/29574main.html>

http://www.uu.nl/content/studyguide_msc_es_2006-2007.pdf

Introduction

This MSc program Biogeology builds on the BSc track Biogeology of both Earth Sciences and Biology (Sciences), combining both disciplines. It aims at students with a Bachelor's degree in one of these disciplines and an interest in ecology, evolution or paleoecology. The programme focuses on '*system Earth*' and climate, studying the fundamental processes that drive natural systems; in particular those processes that have a strong impact on the biosphere and biodiversity. Emphasis is placed on the interaction between communities of living organisms and the changing lithosphere, hydrosphere and atmosphere. Biogeologists use knowledge of processes that have affected the Earth in the past (for instance the effects of climate change on the biosphere) to analyse future threats that might endanger our global system.

Biogeology is expanding rapidly in response to the demand for knowledge about how the global ecosystem will develop in the next 50 to 500 years. Traditionally, geologists deal with time spans of million of years, whereas biologists deal with time spans of days to years. Biogeologists complement both, by studying processes in the past in extreme detail and by looking at contemporary and future processes at intermediate time scales of decades to centuries. The knowledge acquired is essential if governments are to understand and assess future threats and take effective measures.

The BSc biogeology track

Biogeology can be selected within the BSc programs of **biology** as well as **earth sciences**, as a major or minor program in the 2nd and 3rd years. It is an interdisciplinary track introducing '*system Earth*', notably introducing the processes that drive natural systems, in particular those processes that have a strong impact on the biosphere and biodiversity. Emphasis is placed on the interaction between communities of living organisms and the changing lithosphere, hydrosphere and atmosphere. It prepares for the MSc *Biogeology*.

"Marine" BSc courses:

Course name/subject	Course #	BSc level	ECTS	% Marine
Introduction Biogeology	BIO-B2INBIO6	200	7.5	60%
Marine Sciences I & II	BIO-B3MSCI05	200-300	7.5	100%
Palaeoceanography I	GEO3-1318	300	7.5	100%
Sedimentation, Fauna & Climate	GEO-3-1319	300	7.5	100%

Marine aspects also present in courses GEO: introduction palaeoecology (level 200) & evolutionary ecology (level 200).

Websites:

http://www.bio.uu.nl/opleiding/studerenopleiding/Bacheloropleiding/Bachelor_2006-2007/index.html

<http://www.geo.uu.nl/onderwijs/bachelor/aardwetenschappen/opbouw/tweedeenderdejaaj/30307main.html>

The Biogeology MSc programme

This 2-year programme consists of courses and research, for a total of 120 European Credit Transfer System (ECTS) points.

Year 1

In the first year, students must follow a number of courses, including several that have a marine component:

Course name/subject	Course #	ECTS	% Marine
Extreme Climate Transitions	BIO - MABP03	7.5	50%
Astronomical Forcing of Climate & Timescales	GEO4-1412	7.5	75%
Biogeochemistry	GEO4-1413	7.5	75%
Paleoceanography & Climate Variability	GEO4-1405	7.5	100%
Organic Geochemistry	GEO4-1420	7.5	90%

Year 2

In the second year, students will focus on research for their Master's thesis and related courses. Students will be required to take periodical written exams, submit papers, write a Master's thesis and defend the results of their research.

C.2. Master track: PLANT BIOLOGY

Utrecht University, Faculty: Science (Biology).

Level: 400/500; ECT's: 120; Coord.: Prof. Dr. C. Pieterse (Biology)

Websites: <http://www.bio.uu.nl/plantbiology/>

Introduction

The MSc Plant Biology focuses on growth and development of plants and algae and their interactions with the biotic and abiotic environment. Included in these studies are evolutionary and historical aspects. Plant Biology is multidisciplinary in its approach and includes organizational levels ranging from genes, cells, organisms to populations and ecosystems.

Plant Biology is a two-year MSc that educates and trains students to a high academic level. Students are, individually or in a team, be challenged to solve fundamental and applied plant biological problems. All courses and practical training are given in English by a team of internationally distinguished scientists.

Part of this MSc program builds on the BSc track Biogeology of both Earth Sciences and Biology (Sciences), combining both disciplines. It aims at students with a Bachelor's degree in one of these disciplines and an interest in ecology, evolution or paleoecology. This part of the BSc program focuses on '*system Earth*' and climate, studying the fundamental processes that drive natural systems; in particular those processes that have a strong impact on the biosphere and biodiversity. Emphasis is placed on the interaction between communities of living organisms and the changing lithosphere, hydrosphere and atmosphere.

The BSc marine plant biology track

Similar to Biogeology, Within the BSc programs of **biology** as well as **earth sciences**, as a major or minor program in the 2nd and 3rd years, marine courses may be selected for the 'plant biology MSc with a marine signature'. It is an interdisciplinary track introducing '*system Earth*', notably introducing the processes that drive natural systems, in particular those processes that have a strong impact on the biosphere and biodiversity. Emphasis is placed on the interaction between communities of living organisms and the changing lithosphere, hydrosphere and atmosphere.

"Marine" BSc courses:

Course name/subject	Course #	BSc level	ECTS	% Marine
Introduction Biogeology	BIO-B2INBIO6	200	7.5	60%
Marine Sciences I & II	BIO-B3MSCI05	200-300	7.5	100%
Palaeoceanography I	GEO3-1318	300	7.5	100%
Sedimentation, Fauna & Climate	GEO-3-1319	300	7.5	100%

Marine aspects also present in courses GEO: introduction palaeoecology (level 200) & evolutionary ecology (level 200).

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<http://www.geo.uu.nl/onderwijs/bachelor/aardwetenschappe/opbouw/tweedeenderdejaaj/30307main.html>

The Plant Biology MSc programme

This 2-year programme consists of courses and research, for a total of 120 European Credit Transfer System (ECTS) points.

Year 1

In the first year, students must follow a number of courses, including several that have a marine component:

Course name/subject	Course #	ECTS	% Marine
Extreme Climate Transitions	BIO -_MABP03	7.5	50%
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Biogeochemistry	GEO4-1413	7.5	75%
Paleoceanography & Climate Variability	GEO4-1405	7.5	100%
Organic Geochemistry	GEO4-1420	7.5	90%

Year**2**

In the second year, students will focus on research for their Master's thesis, often multi-institute projects (e.g., UU, NIOZ, and foreign institutions), and related courses. Students will be required to take periodical written exams, submit papers, write a Master's thesis and defend the results of their research.

C.3. Master track: Paleo-Climate and Geo-Ecosystems

Vrije Universiteit, Faculty of Earth and Life Sciences, Dept. Paleoclimatology & Geomorphology.

Level: 400/500; ECT's: 120; Coord.: Dr. G.M. Ganssen; Dr. S. Jung, Dr. S. Bohncke
Website:

http://www.falw.vu.nl/Aankomende_students/index.cfm/home_subsection.cfm/subsectionid/3ED1772C-9287-40D3-94CBC931E2C4C5E9

Introduction

This two years' program is designed to illuminate the processes that control the modern climate and marine and terrestrial geo-ecosystems and the variations that have taken place in the past. The setup of the courses in the initial four month's is designed to spawn an in-depth understanding of the dynamic relationships between climate and geo-ecosystems. In addition, extreme conditions in Earth's history are used to assess potential future scenarios. Are extremely high CO₂-concentrations in the past beneficiary to predict the consequences of anthropogenic CO₂-increase? What are the consequences of sea level change for coastal geo-ecosystems and drainage patterns of the major river systems? The course "Modern Climate Systems" provides the basic knowledge of the atmospheric and oceanic controls of Earth's climate. Subsequently, functioning of modern marine and terrestrial geo-ecosystems and their potential to record environmental change are central topics of the course "Sedimentary environments: Dynamics and Climate Change Recorders". A series of three courses will highlight the impact of climate change on the various geo-ecosystems. Also, extreme events, e.g. meteorite impacts, greenhouse gas events and orbitally induced environmental change, are discussed. Two successive courses will focus on rapid environmental change on time scales of millennia to seasons.

A series of follow-up courses will focus on these detailed understanding of global processes and climate change. The course "Climate Modeling" introduces the principles behind the various models and illustrates those based on practical examples. The large-scale cycle systems as for example the carbon cycle, their role in Earth climate and the consequences for marine and terrestrial geo-ecosystems are central topics in the course "Modern and Past Global Biogeochemical Cycles". The effects of variations in Earth' climate on the human evolution and vice versa will be illustrated in the course "Man and Climate: from hominids to modern civilizations". Finally, an assessment of the impact of environmental change on policy makers is central topic in the course "Climate and Policy" ending the series of compulsory courses.

The second year offers a choice of various optional courses including those from partner institutes abroad. In addition, working periods within an industrial organization, company or at other institutes can be arranged. Finally, a "Research Project" and a "Master's Thesis" need to be completed.

General structure of the MSc program

The specialized Masters program 'Paleoclimate and Geo-ecosystems' (officially accredited since summer 2006) is a full time research master education. Study load is 120 credits (ECTS - European Community Course Credit Transfer System) divided over two years. One credit equals 28 hours of study and includes participation in lectures and practical courses, preparation and other homework, masters' research and report writing. The course program is designed to cover the most relevant aspects related to (Global) Environmental change as well as an assessment of the socio-political implications. Besides classes, excursions and practical exercises, ample time is reserved for individual research based on climate and geo-ecosystem archives such as marine/terrestrial sediment cores, speleothems and corals. Courses partly given by external experts as well as a course and research project exchange with leading inter-/national institutions safeguards the high quality of this Masters'.

Below a list with those courses which fulfill the =>50% marine level

Course name/subject	Course #	ECTS	% Marine
Modern Climate Systems	450185	3	=>50
Sedimentary Environments: Dynamics and Climate Change Recorders	450220	5	=>50
Palaeoclimate Change and Environmental Impacts - the Long-Term Record	450221	2	=>50
Paleoclimate Change and Environmental Impacts- the Millennial to Centennial	450222	5	=>50
Palaeoclimate Change and Environmental Impacts - the Decadal to Seasonal Record	450223	5	=>50
Climate Modelling	450224	6	=>50
Modern and Past Global Biogeochemical Cycles	450186	9	=>50

BSc Courses for 'Paleoclimate and Geo-ecosystems' Program.

Course name/subject	Course number	BSc level	ECTS	% Marine
Global change	450007		3	50