



# GEOS807

## Problems in Sedimentary Geology

S1 Day 2019

*Dept of Earth and Environmental Sciences*

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## General Information

Unit convenor and teaching staff

Unit Convenor

Simon George

[simon.george@mq.edu.au](mailto:simon.george@mq.edu.au)

Contact via [simon.george@mq.edu.au](mailto:simon.george@mq.edu.au)

Room 329, 12 Wally's Walk,

Send email to book time

Credit points

4

Prerequisites

Permission by special approval

Corequisites

Co-badged status

Unit description

This unit is a project-based unit with topics selected from the field of sedimentary geology.

Students are required to contact a supervisor.

## Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

## Learning Outcomes

On successful completion of this unit, you will be able to:

The ability to select appropriate techniques to obtain information on the chemical composition of sedimentary rocks and fluids such as oils and gases

Practical experience in carrying out basic organic geochemical procedures and interpreting and synthesising large and complex organic geochemical datasets

Demonstrated ability to communicate the results of practical organic geochemical experiments to a wider audience through masters level writing and oral presentation

A firm basis for applying organic geochemical technology to solving petroleum system problems and to deconvoluting the early biosphere.

The ability to undertake large organic geochemistry research projects at HDR level.

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#">Assignment 1</a>	30%	No	3 May 2019 17:00
<a href="#">Practical work 1</a>	30%	No	5th April 2019, 17:00
<a href="#">Practical work 2</a>	40%	No	7th June 2019, 17:00

### Assignment 1

Due: **3 May 2019 17:00**

Weighting: **30%**

Assignment 1: Carbon, hydrogen and sulphur isotopic compositions, focus on research aspects

On successful completion you will be able to:

- The ability to select appropriate techniques to obtain information on the chemical composition of sedimentary rocks and fluids such as oils and gases
- A firm basis for applying organic geochemical technology to solving petroleum system problems and to deconvoluting the early biosphere.
- The ability to undertake large organic geochemistry research projects at HDR level.

### Practical work 1

Due: **5th April 2019, 17:00**

Weighting: **30%**

Practical work 1: North Sea Oil fractionation, GC-MS and interpretation

On successful completion you will be able to:

- The ability to select appropriate techniques to obtain information on the chemical composition of sedimentary rocks and fluids such as oils and gases
- Practical experience in carrying out basic organic geochemical procedures and interpreting and synthesising large and complex organic geochemical datasets
- Demonstrated ability to communicate the results of practical organic geochemical experiments to a wider audience through masters level writing and oral presentation
- A firm basis for applying organic geochemical technology to solving petroleum system problems and to deconvoluting the early biosphere.
- The ability to undertake large organic geochemistry research projects at HDR level.

## Practical work 2

Due: **7th June 2019, 17:00**

Weighting: **40%**

Practical work 2: Extraction of sedimentary rocks, GC-MS and oil-source correlation

On successful completion you will be able to:

- The ability to select appropriate techniques to obtain information on the chemical composition of sedimentary rocks and fluids such as oils and gases
- Practical experience in carrying out basic organic geochemical procedures and interpreting and synthesising large and complex organic geochemical datasets
- Demonstrated ability to communicate the results of practical organic geochemical experiments to a wider audience through masters level writing and oral presentation
- A firm basis for applying organic geochemical technology to solving petroleum system problems and to deconvoluting the early biosphere.
- The ability to undertake large organic geochemistry research projects at HDR level.

## Delivery and Resources

**Unit handout: GEOS807: Organic geochemistry techniques (Session 1, 2019)**

### Unit Description

This unit provides the foundations on how to go about analysing the chemical composition of sedimentary rocks and fluids such as oils and gases, and especially the organic constituents. This unit will showcase organic geochemical techniques and will be strongly practically based. It will cover the following topics: (1) Samples and preparation. (2) Microscopy and microprobe. (3) Bulk / solids analysis, including elemental analysis, total organic carbon and pyrolysis techniques such as Rock-Eval, MSSV and laser microprobe. (4) Solvent extraction of rocks and fractionation of total extracts and oils. (5) Gas chromatography-mass spectrometry, including MS-MS and GCxGC. (6) Time-of-Flight-Secondary Ion Mass spectrometry. (7) Stable C, H, N, O and S isotopes of sedimentary rocks and fluids such as oils and gases. Experience will also be gained in the manipulation and interpretation of data generated by these techniques. Lastly, these techniques will be applied to understanding petroleum systems and to deconvolution of the early biosphere.

Undergraduates with a major in geology will likely have a basic understanding of organic geochemistry and no practical skills in this subject. Similarly, undergraduates with a major in chemistry will likely have a good understanding of analytical and organic chemistry, and some lab skills, but may not have a depth in understanding of how these skills can be applied to geological samples. This unit allows a Masters of Geoscience or Research student who has limited hand-on research experience to gain an advanced understanding of organic

geochemistry, and to develop their practical skills in an organic geochemistry laboratory. They will start to develop skills related to the manipulation of raw data and the interpretation of large and complex datasets. Two practical applications of these techniques will be presented which are topical to both industry and further research.

## **Contacts and Communication**

### **Convenor: Professor Simon George**

simon.george@mq.edu.au      02 9850 4424

Department of Earth and Planetary Sciences (EPS), Room 329, 12 Wally's Walk, Macquarie University.

Other contact details: Lab is E7B 340. Lab phones are 02 9850 8273/8274. Mobile: 0418 428217

<http://web.science.mq.edu.au/directory/listing/person.htm?id=sgeorge>

## **Readings and Textbook**

- Peters et al. 2005, The Biomarker Guide. 2 volumes, multiple copies in library (TN271.P4 P463), and there are also two Organic Geochemistry lab copies of each volume.
- Also Vol 2 is available through library as e-book:

(Search Biomarker Guide on MU Library site, and click on "[Electronic version available via EBL](#)")

## **Web pages and electronic resources**

The main unit web page will be on iLearn: <https://ilearn.mq.edu.au/login/MQ/>

iLearn is Macquarie's learning management system. Assignments, hand-outs, and reading material will be available here.

## **Assessment criteria**

Marks are awarded for an assignment and practical work:

Assignment 1: Carbon, hydrogen and sulphur isotopic compositions	30%
Practical work 1: North Sea Oil fractionation, GC-MS and interpretation	30%
Practical work 2: Extraction of sedimentary rocks, GC-MS and oil-source correlation	40%

### **Student workload**

This is a 4 credit point unit. It is anticipated that you will spend ~10 hours per week involved with the unit, over the 15 weeks of session (total 150 hours).

Background reading for lectures and revision (2 hours/week, 3 weeks = 6 hours)

Lectures (2 hour/week, 3 weeks = 6 hours)

Practical 1: North Sea Oil fractionation, GC-MS and interpretation: 48 hours

Practical 2: Extraction of sedimentary rocks, GC-MS and oil-source correlation: 60 hours

Assignment 1: Carbon, hydrogen and sulphur isotopic compositions: 30 hours

**Total workload: 150 hours (4 cps)**

### **Classes**

#### **Lectures**

There will be 4 lectures to introduce the unit and give you a grounding in the theory behind some of the techniques. It is important that you attend these lectures, as they include discussion sections, and also problem solving on hard copy handouts. The location will be in the 12 Wally's Walk (E7A) 324, tentatively Tuesday mornings (weeks 1, 2, 3 and 4).

#### **Practicals**

The majority of the unit will be (1) practical material taught in the Organic Geochemistry lab at Macquarie University (E7B340/344) by Simon George, perhaps with assistance from other research students at times, and (2) independent research, reading, and writing of reports and assignment.

The practicals will be in the Organic Geochemistry Laboratory, E7B340/344 on Tuesdays (tentatively), or other days as we decide. You may well spend more time in the lab in some weeks than others (block mode), and this may be partly driven by access to fume cupboards and instruments. The weeks when I would like to concentrate supervised lab effort are:

Weeks 3 and 4,

Weeks 8 to 10.

In other weeks, you will need to work on processing analytical data from the samples (in the lab), and writing up the experiments (in your own time). This will have to be coordinated between everyone doing the unit, as there are only 2 PCs for GC-MS data processing (USB key locked).

In the first week, we will concentrate on:

1. Familiarisation with the lab and lab induction, including access arrangements via swipe card (your CDX number on student card will be needed for profiling for access to E7B 340/344): <http://facilities.science.mq.edu.au/form.php>

Ron Claassens may also be able to help: [ron.claassens@mq.edu.au](mailto:ron.claassens@mq.edu.au)).

2. Reading material safety data sheets (MSDS)

3. Completing risk assessments.

4. Each of you will need to have a chemical safety induction (if not done already).

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central\)](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

Undergraduate students seeking more policy resources can visit the [Student Policy Gateway \(https://students.mq.edu.au/support/study/student-policy-gateway\)](https://students.mq.edu.au/support/study/student-policy-gateway). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central \(https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central\)](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/study/getting-started/student-conduct>

## Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in [eStudent](#). For more information visit [ask.mq.edu.au](mailto:ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

## Learning Skills

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to improve your marks and take control of your study.

- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)

## Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

## Student Enquiries

For all student enquiries, visit Student Connect at [ask.mq.edu.au](mailto:ask.mq.edu.au)

If you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/).

When using the University's IT, you must adhere to the [Acceptable Use of IT Resources Policy](#). The policy applies to all who connect to the MQ network including students.

## Graduate Capabilities

### PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and decisions that reflect both the nature of their professional work and their personal perspectives.



This graduate capability is supported by:

## **Learning outcomes**

- The ability to select appropriate techniques to obtain information on the chemical composition of sedimentary rocks and fluids such as oils and gases
- Practical experience in carrying out basic organic geochemical procedures and interpreting and synthesising large and complex organic geochemical datasets
- Demonstrated ability to communicate the results of practical organic geochemical experiments to a wider audience through masters level writing and oral presentation
- A firm basis for applying organic geochemical technology to solving petroleum system problems and to deconvoluting the early biosphere.
- The ability to undertake large organic geochemistry research projects at HDR level.

## **Assessment tasks**

- Assignment 1
- Practical work 1
- Practical work 2

## **PG - Discipline Knowledge and Skills**

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:

## **Learning outcomes**

- The ability to select appropriate techniques to obtain information on the chemical composition of sedimentary rocks and fluids such as oils and gases
- Practical experience in carrying out basic organic geochemical procedures and interpreting and synthesising large and complex organic geochemical datasets
- Demonstrated ability to communicate the results of practical organic geochemical experiments to a wider audience through masters level writing and oral presentation
- A firm basis for applying organic geochemical technology to solving petroleum system problems and to deconvoluting the early biosphere.
- The ability to undertake large organic geochemistry research projects at HDR level.

## **Assessment tasks**

- Assignment 1
- Practical work 1

- Practical work 2

## PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

### Learning outcomes

- The ability to select appropriate techniques to obtain information on the chemical composition of sedimentary rocks and fluids such as oils and gases
- Practical experience in carrying out basic organic geochemical procedures and interpreting and synthesising large and complex organic geochemical datasets
- A firm basis for applying organic geochemical technology to solving petroleum system problems and to deconvoluting the early biosphere.
- The ability to undertake large organic geochemistry research projects at HDR level.

### Assessment tasks

- Assignment 1
- Practical work 1
- Practical work 2

## PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

### Learning outcomes

- The ability to select appropriate techniques to obtain information on the chemical composition of sedimentary rocks and fluids such as oils and gases
- Practical experience in carrying out basic organic geochemical procedures and interpreting and synthesising large and complex organic geochemical datasets
- A firm basis for applying organic geochemical technology to solving petroleum system problems and to deconvoluting the early biosphere.
- The ability to undertake large organic geochemistry research projects at HDR level.

## Assessment tasks

- Assignment 1
- Practical work 1
- Practical work 2

## PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

## Learning outcomes

- The ability to select appropriate techniques to obtain information on the chemical composition of sedimentary rocks and fluids such as oils and gases
- Practical experience in carrying out basic organic geochemical procedures and interpreting and synthesising large and complex organic geochemical datasets
- Demonstrated ability to communicate the results of practical organic geochemical experiments to a wider audience through masters level writing and oral presentation
- A firm basis for applying organic geochemical technology to solving petroleum system problems and to deconvoluting the early biosphere.

## Assessment tasks

- Assignment 1
- Practical work 1
- Practical work 2

## PG - Engaged and Responsible, Active and Ethical Citizens

Our postgraduates will be ethically aware and capable of confident transformative action in relation to their professional responsibilities and the wider community. They will have a sense of connectedness with others and country and have a sense of mutual obligation. They will be able to appreciate the impact of their professional roles for social justice and inclusion related to national and global issues

This graduate capability is supported by:

## Assessment tasks

- Assignment 1
- Practical work 1

- Practical work 2