



GEOS707

Research Project 1

S1 Day 2014

Earth and Planetary Sciences

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General Information

Unit convenor and teaching staff

Co-convenor

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Unit Convenor

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Credit points

4

Prerequisites

Admission to MRes

Corequisites

Co-badged status

Unit description

This unit comprises a research project on a chosen topic. Students will collect and analyse their own data and will compare their findings to literature results on this topic. The results are to be presented in the form of a scientific report or a manuscript prepared for publication. If a student undertakes both GEOS707 and GEOS708 the two projects must be on distinctly different topics.

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:

- Recognize a large variety of deformation and metamorphic microstructures
- Quantitatively record and analyse deformation and metamorphic microstructures
- Relate microstructures to the rheology and history of the specimen analysed
- Interpret microstructures in terms of possible geodynamic settings

Understand and describe accurately the basic principles of phase equilibria, metamorphic textures and reaction textures

Understand the basics of tools such as numerical modelling, EBSD analysis, thermodynamic modelling and image analysis

Assessment Tasks

Name	Weighting	Due
<u>Thinsection Description I</u>	10%	April 12th
<u>Thinsection Description II</u>	10%	April 12th
<u>Pseudosections</u>	30%	29 April 2014
<u>Project</u>	50%	13 May 2014

Thinsection Description I

Due: **April 12th**

Weighting: **10%**

These will be small topic-based presentations 5-10 min on initial practical work describing microstructures and their interpretation.

On successful completion you will be able to:

- Recognize a large variety of deformation and metamorphic microstructures
- Quantitatively record and analyse deformation and metamorphic microstructures
- Relate microstructures to the rheology and history of the specimen analysed
- Interpret microstructures in terms of possible geodynamic settings

Thinsection Description II

Due: **April 12th**

Weighting: **10%**

These will be small topic-based presentations 5-10 min on second part of practical work.

On successful completion you will be able to:

- Recognize a large variety of deformation and metamorphic microstructures
- Quantitatively record and analyse deformation and metamorphic microstructures

- Relate microstructures to the rheology and history of the specimen analysed

Pseudosections

Due: **29 April 2014**

Weighting: **30%**

Presentation of calculated Pseudosections which is part of the Thermodynamics Part of the course

On successful completion you will be able to:

- Understand and describe accurately the basics principles of phase equilibria, metamorphic textures and reaction textures
- Understand the basics of tools such as numerical modelling, EBSD analysis, thermodynamic modelling and image analysis

Project

Due: **13 May 2014**

Weighting: **50%**

Each student will undertake a detailed analysis (image analysis, chemical analysis, EBSD etc.) of one to two thinsections. Each student will write a report about the findings of the analysis and give a presentation of those findings in form of a scientific paper. This could be also a “warm-up” for a potential Masters Project (year 2 of MRes)

On successful completion you will be able to:

- Recognize a large variety of deformation and metamorphic microstructures
- Relate microstructures to the rheology and history of the specimen analysed
- Interpret microstructures in terms of possible geodynamic settings
- Understand and describe accurately the basics principles of phase equilibria, metamorphic textures and reaction textures
- Understand the basics of tools such as numerical modelling, EBSD analysis, thermodynamic modelling and image analysis

Delivery and Resources

Textbook, Webpages and Technology Used.

The textbooks for the unit are

A Practical Guide to Rock Microstructure. Vernon, R.H. 2004.

Microtectonics. Passchier & Trouw, 2005.

Rheology of the Earth. Ranalli, G., 1995.

Metamorphic phase modeling software - Thermocalc: <http://www.metamorph.geo.uni-mainz.de/thermocalc/>

Elle Microstructure Modelling software - <http://www.materialsknowledge.org/elle/>

Deformation Microstructure Course - <http://virtualexplorer.com.au/special/meansvolume/contribs/jessell/index.html>

Image Analysis Program (for Mac) NIH Image - <http://rsb.info.nih.gov/nih-image/about.html>

Image Analysis Program (for PC) Image J - <http://rsb.info.nih.gov/ij/>

Unit Schedule

Microstructures to Plate tectonics: S Piazolo and N. Daczko						
Date	Weekday	Time	Location	Lectures (all recorded in 2013) *Listen to recorded lecture only (no live performance)	Practicals / Laboratory work	Readings / Online EBSD course / Online Thermocalc course
4-Mar	Tues	9.00-11.00	E5A 210	SPlect 1a: Intro to Rheology		Ranalli: chapter 1, chapter 2, chapter 3
		12.00-2.00		SPlect 1b: The atomic basis for deformation mechanisms		Ranalli: chapter 9.1&9.3, Passchier and Trouw

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11-Mar	Tues	9.00-11.00	E5A 210	SPLect 2a &: Rheology concepts II & Annealing mechanisms, Dynamic recrystallization, and dislocation creep		Ranalli: Passchier and Trouw, chapter 1- 3, 9.1&9.4
		11.00-2.00	E5A 210	*NDLect 1: How the microscope works	Optical Microscopy (microstructures), Exercise 1 (paper), Define first presentation topics	
18-Mar	Tues	9.00-10.00	E5A 210	SPLect 3a: Rheology Concepts III		Ranalli: chapter 9.1&9.3
		10.00-11.00	E5A 210	*SPLect 3b: shear sense indicators, CPO		Passchier and Trouw 4.13, 5
		11.00-2.00	E5A 210		Optical Microscopy (microstructures), Exercise 2 (paper), First presentations (5 min)	
25-Mar	Tues	9.00-11.00	E5A 210	SPLect 4a & 4b: Rheology Concepts IV - diffusion, metamorphism and deformation		Passchier and Trouw
		11.00-2.00	E5A 210		Optical Microscopy (microstructures), Exercise 3 (paper), Define second presentation topics	
1-Apr	Tues	9.00-11.00	E5A 210	SPLect 5: Rheology Concepts V (summary) - dissolution precipitation, fringes, veins		Passchier and Trouw
		11.00-2.00	E5A 210		Optical Microscopy (microstructures), Second presentations (5 min)	

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26-Mar	Tues	9.00-11.00	E5A 210	*SPlect 6A/B/C: Bringing it all together & deformation mechanisms in different minerals, gb hierarchy		Passchier and Trouw
		11.00-12.00	E5A 210		Discuss SEM/EBSD/Thermocalc Projects, install EBSD program (BRING laptops to install program)	
		12.00-2.00	E5A 210		Optical Microscopy (microstructures), EBSD exercise	EBSD course
1-13 April					Acquisition of SEM/EBSD data for Project	
1-Apr	Tues	9.00-11.00	E5A 210	*SPlect 7: Techniques I: Numerical Simulations - overview and ELLE		Powell, 1978: Chapters 1 & 2
		11:00-12:00	E5A 210	*NDlect 2: Mineral assemblages, phase diagrams, P-T grids, pseudosections and compatibility diagrams		Powell, R. & Holland, T.J.B., 2008. On thermobarometry. Journal of Metamorphic Geology, 26, 155–179.
		1.00-2.00	E5A 210		Finish Optical Microscopy (microstructures)	EBSD & Thermocalc courses; Questions about projects
8-Apr	Tues	9.00-10.00	E5A 210	*SPlect 8: Techniques II: Analog Modelling and Image analysis (SPO)		Powell, 1978: Chapters 7 & 8
		10:00-11:00	E5A 210	*NDlect 3: Changes to mineral assemblages, modes and mineral chemistry		Powell, R. & Holland, TJB, 1994. Optimal geothermometry and geobarometry. American Mineralogist 79, 120–133.

		11:00-12:00	E5A 210	*NDLect 4: Heterogeneity in metamorphic rocks, equilibrium volume and reaction textures	Define Third presentation (10 min Thermocalc)	
		10.00-2.00	E5A 210		Optical Microscopy (metamorphic textures)	EBSD & Thermocalc courses; Questions about projects
Mid Semester Break				*NDLect 5: Compositional zoning, solid solution and chemical diffusion		Finish EBSD & Thermocalc courses
				*NDLect 6: Fluids, open vs closed systems and retrogression		Holland, TJB, & Powell, R, 1998. An internally-consistent thermodynamic dataset for phases of petrological interest. Journal of Metamorphic Geology 16, 309–344.
29-Apr	Tues	9.00-11.00	E5A 210		Third presentations (10 min Thermocalc)	Submit EBSD and Thermocalc exercises (due 29 April)
6-May	Tues	9:00-11:00	Offices			Questions about projects
13-May	Tues	9:00-10:00				Submit project reports
Thinsections:		Please leave in E5A 210 in allocated box - so everybody can look at them. If you need photos, go to E5A 210 when there is no classes, or you can go to the office next door (Nigels office, ask PhD students for entrance / how to work things				

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](#). Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy <http://mq.edu.au/policy/docs/grading/policy.html>

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of 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/support/student_conduct/

Extensions and Penalties:

Whenever possible requests for an extension should be submitted prior to an assignment's due date. Late assignments will be date stamped and a penalty of 10% initially and then 5% per day (Monday to Friday) will be deducted from the total mark.

Academic Honesty and Plagiarism

Plagiarism involves using the work of another person and presenting it as one's own. If you use the work of another person without clearly stating or acknowledging the source, you are falsely claiming that material as your own work and committing an act of **PLAGIARISM**. This is a very serious violation of good practice and an offence for which you will be penalised. You should read the University's policies and procedures on plagiarism. These can be found at: http://www.mq.edu.au/policy/docs/academic_honesty/policy.html

The policies and procedures explain what plagiarism is, how to avoid it, the procedures taken in cases of suspected plagiarism, and the penalties if you are found guilty. Penalties may include a deduction of marks, failure in the unit, and/or referral to the University Discipline Committee.

As such, the project assignment must have a signed "Faculty of Science" (FoS) assignment cover sheet attached. These sheets are available from the Science centre or from the FoS WEB page.

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) 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

IT Help

For help with University computer systems and technology, visit <http://informatics.mq.edu.au/help/>.

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