

MACQUARIE  
UNIVERSITY



FACULTY OF  
SCIENCE

**GEOS204**  
**Life, the Universe and Everything**

2011 SEMESTER 1

**42**

## **Unit information: GEOS204: Life, the Universe and Everything (2011) (3 cps).** **Faculty of Science, Department of Earth and Planetary Sciences, Macquarie University.**

### **Unit Description**

This is a broad-based interdisciplinary science unit which aims to present a non-technical overview of recent ideas in science. Many of these ideas, but not all, relate to astrobiology, which is about the origin of life on Earth and the possibility of finding life elsewhere in the universe. The presentation will be suitable for students without any science background. The unit will:

- Present an integrated view of science across a broad range of disciplines (geoscience, biology, cosmology, chemistry).
- Look at some of the “Big Questions” (e.g. Origin of the Universe, What is Life?, Are We Alone?, Early Earth Environments).
- Present science as it is actually done, not just as a set of facts.

Unit assessment is weighted towards assignments, with 30% on a class test in the last week of classes.

The Unit will be presented in 4 broad themes:

- 1. Life and The Universe:** (*Cosmology, Astronomy and Space, Geoscience*). What is Life? Concepts about the origin of life. Origin of the Universe, formation of the Solar System, meteorites.
- 2. Life and Rocks on Early Earth and Mars:** (*Astronomy, Geoscience*). Formation of the Earth; Early Earth and Mars environments and the first billion years of life.
- 3. Biology of Life and Habitability** (*Biology, Astronomy, Chemistry*). The environments of the planets, where life can live. Molecular biology and predictions about the earliest organisms. Biomarkers as proxies for life.
- 4. Life Elsewhere, SETI:** (*Astronomy, Chemistry, Astrobiology*). The chemistry of space; Are We Alone?

### **Why Choose Life, the Universe and Everything?**

If you are interested in finding out about the origin of life on Earth and the possibility of finding life elsewhere in the universe, you will find this unit informative, interesting and challenging.

### **Key Learning Outcomes**

The key learning outcomes for this unit are:

- Understanding the origin of life on Earth and the possibility of finding life elsewhere in the Universe.
- Understanding of scientific methodology.
- Competence in accessing, using and synthesising appropriate information.
- Understanding that scientific knowledge is always advancing and changing.
- Distinguishing between complex and sometimes mutually exclusive hypotheses.
- Application of knowledge to solving problems and evaluating ideas and information.
- Capacity to present ideas clearly with supporting evidence.

### **Classes:**

Attend two lectures and 1 practical/tutorial each week.

**Lectures: Y3A T1**, Fridays 14:00-15:00 and 15:00-16:00. PLEASE NOTE THAT DUE TO THE LARGE CLASS SIZE THAT THIS LECTURE ROOM HAS CHANGED FROM THE ORIGINAL TIMETABLED.

**Practicals: E5A 132**, 6 classes:

1. Mondays, 11:00-12:00
2. Tuesdays, 11:00-12:00
3. Tuesdays, 12:00-13:00
7. Tuesdays, 14:00-15:00 (*late addition*)
4. Fridays, 09:00-10:00
5. Fridays, 10:00-11:00
6. Fridays, 12:00-13:00

### **Highly Recommended Textbook and Background Reading**

Bennett, J, and Shostak, S (2007). *Life in the Universe* (2nd Ed). San Francisco, Pearson/Addison Wesley.

- This book may be purchased from the Co-op Bookshop. It is highly recommended that you purchase this book during the first week of semester.

- Also see the separate booklist for other readings.
- Astrobiology is an interdisciplinary subject involving aspects of astronomy, geology, biology and chemistry. Few students (or indeed staff!) have a background in all of these areas, so even if you have done some science units before you must expect to do a lot of extra reading and research to be able to understand all the information that will be presented in the unit. For those students without a science background (e.g. those doing it for “Planet” purposes), this breadth provides you the opportunity to become familiar with several aspects of science over the course of the unit. No prior knowledge of any science will be assumed.

### Assignments

The unit assignments and final test are heavily essay based, so skill at writing essays is important. Each assignment topic must be fully researched and the essay written in your own words. Cutting and pasting information from web pages is NOT acceptable. Information you do obtain from other sources (brief quotes, images, ideas) must be fully referenced in the text (author, year), with references listed at the end of the essay (year, author, title, journal or link). Additional information on referencing and plagiarism is provided in a separate handout. Students who fail in these fundamental principles and basic skills WILL SCORE ZERO for assignments.

University Academic Honesty Policy:

[http://www.mq.edu.au/policy/docs/academic\\_honesty/policy.pdf](http://www.mq.edu.au/policy/docs/academic_honesty/policy.pdf)

The three major assignments will be due by 11am on Fridays of the specified week and are to be delivered as hard copy to the Science Centre, level 1 of E7A. There is an after-hours assignment box located adjacent to the south door of E7A (facing E5A). Please ensure you keep an electronic copy of each assignment. The three major assignments must have a completed and signed Faculty of Science cover sheet stapled to the front. Signing this cover sheet is your undertaking that you have read and understood the information on plagiarism. The cover sheet is downloadable from the Faculty of Science:

<http://web.science.mq.edu.au/intranet/lt/barcode/coversheet.php>.

In addition, all 3 assignments are to be submitted using **Turnitin**. Macquarie University promotes student awareness of information management and information ethics. As well as training and the provision of general information, the University tackles the issue of plagiarism through use of an online plagiarism detection tool (Turnitin). This software is used in conjunction with a set of procedures to ensure its use is equitable. You need to submit the text of all 3 assignments for GEOS204 to Turnitin via the Internet as part of the submission process for your assignment.

**HOWEVER, YOU MUST ALSO SUBMIT A COMPLETE HARD COPY OF YOUR ASSIGNMENTS AND COVER SHEET AS DESCRIBED ABOVE**

Turnitin automatically compares your work to the work of your classmates, previous students from Macquarie and other universities, with material available on the Internet, both freely available and subscription-based electronic journals. The results will be sent only to your lecturer, who will analyse these in reference to the University's standard Policy on Plagiarism.

### Turnitin Procedure

1. Visit Turnitin: <http://www.turnitin.com> and create a user profile (if you don't have one already). “Create account” is top right under box labelled “email”. You may do this from any computer. Select the user type 'student' and enter your university email address. If you do not know your university email address, please contact Student IT Help via <http://www.sith.mq.edu.au>
2. Once you are set up with a profile, login (top right at <http://www.turnitin.com>)  
The class ID is 3822702. The password for GEOS204 is “geos204mac” (all lowercase, one word).
3. Upload your assignment. You can copy the text from your assessment task and paste it into the text box, or you can link to a local file for upload. A digital receipt will be generated. Please save a copy of it.

For help or more detailed instructions on turnitin:

[http://turnitin.com/resources/documentation/turnitin/training/en\\_us/qs\\_student\\_en\\_us.pdf](http://turnitin.com/resources/documentation/turnitin/training/en_us/qs_student_en_us.pdf)

We will endeavour to return marked assignments to you within 14 days of submission, and marked practical/tutorial question sheets within 7 days of submission. Please be aware that this is a very big class in 2011, and we may miss this target sometimes. If at any time you have reason to query an assignment mark, please contact Simon George by phone or email to arrange a meeting.

### **Illness and Extensions**

If you want consideration for illness when submitting any assignments, a doctor's certificate **MUST** be stapled to the front of the assignment behind the Faculty of Science cover sheet.

If you want to apply for an extension, you must **EMAIL** Simon **BEFORE THE DUE DATE** of the assignment and state the reason you are seeking an extension. This will not be granted automatically, but will be considered on a case-by-case basis. You will be notified by return email as to when you will need to submit your assignment. Attach a copy of the email to the assignment and tick on the cover sheet that the extension has been granted. **LATE PENALTIES** (loss of marks) will apply for work that is late where no extension has been granted: it is a 10% per day penalty for late work (i.e. 1/10 of the marks allocated to the exercise will be deducted for each weekday that the work is late).

University Special Consideration Policy:

[http://www.mq.edu.au/policy/docs/special\\_consideration/procedure.html](http://www.mq.edu.au/policy/docs/special_consideration/procedure.html)

### **Lectures, availability of lecture material and attendance requirements**

It is the policy in this unit that students will normally attend the two lectures per week, and one practical/tutorial, and make their own notes from the lectures. It is expected that many of the lectures will be interactive, with questions and answers throughout. Lectures will be recorded using iLecture, and files of the lecture graphics will also be made available through iLecture. These will be particularly useful for revision purposes. Many of the practicals/tutorials are assessed, it is important that you attend one of these each week.

### **Hours**

This is a 3 credit point unit. It is anticipated that you will spend >9 hours per week involved with the unit, including the 3-hour class contact time per week. It is particularly important that you spend plenty of time preparing the three major assignments. Note that this unit finishes with the class test in week 13, so the study period for these 3 cps is a bit shorter than for units with exams.

### **Web page and electronic resources**

The unit web page is on Blackboard: <https://learn.mq.edu.au>

Assignments, hand-outs, reading material and on-line quizzes will be available here.

The unit web page includes two messaging tools, the Discussions tool and the Mail tool. The Discussions tool is used for messages that either everyone enrolled or selected groups in an online unit can read. Students and lecturers can post and reply to these messages. The Mail tool is used for private messages between you, your lecturer and students in a unit. It is suggested that you check for new discussion and mail messages at least once a week.

Sound recordings of the lectures will be available at iLecture:

<http://ilecture.mq.edu.au/lectopia/lectopia.lasso?ut=800&id=32363>

Pdf files in 8 formats of each lecture will be available for download from iLecture (2-4 days before lecture).

### **On-line quizzes**

After each block of 3 weeks a quiz will open to make sure you have read and understood the lecture material. The 4 quizzes will be available on-line through the Blackboard system and altogether are worth 8% of the unit mark. You will do these in your own time, open book, and they will be open for 1 week from the Friday (17:00) at the end of each 3 week block. They will close at 23:00 on the following Friday.

### **Final Test**

A class test will be held in Week 13. It will be based on lectures, unit reading material, lab exercises, information you should have absorbed through completing assignments and any other material presented during classes. A printed English dictionary (not electronic) may be brought in for the test if English is not

your first language. The educational rationale for the class test is to check the acquired knowledge by the students at the end of the unit.

### Late Enrolments

If you enrol late in the unit, you will have already missed one or more lectures. It is your responsibility to catch up. Also, you will still be expected to submit all three assignments within the remaining time.

### Assessment

Marks are awarded for assignments, participation in labs, question sheets, on-line quizzes and the final test. There is no requirement to pass the class test in order to pass the unit. If you are sick on the day of the test, a doctor's certificate WILL be required and you must notify Simon George as soon as possible.

#### Assessment criteria: GEOS204: Life, the Universe and Everything (2011)

Assignment 1: Paper Review (800 words approx.)	10%
Assignment 2: ALH84001 table	15%
Assignment 3: Lander project (1,500 words min.)	20%
Rock practical	4%
Biomarker practical	4%
On-line quizzes (4)	8%
Question sheet: Solar system formation computer exercise	2%
On-line quiz on meteorites	2%
Question sheet on macroscopic life	2%
Question sheet: Virtual Fieldtrip computer exercise	2%
Question sheet: Video: Universe 2001: Beyond the Millennium-Life	1%
Class test (week 13)	30%

### Relationship between assessment and learning outcomes

A number of modes of assessment are used in this unit (multiple choice and true/false on-line quizzes; question sheets; practicals; essays; class test). These are designed to provide different mechanisms of evaluation of discipline-specific and generic learning outcomes of the unit. The on-line quizzes are designed to encourage you to revise the lecture material on a weekly basis and therefore develop your understanding of the material. The practicals provide you with new skills of relevance to searching for life on planets. The question sheets encourage active participation and learning in the video and computer exercises. Similarly, the rationale for the assignments is several fold, including to encourage you to develop your understanding of general astrobiology and some specific aspects of searching for life elsewhere; and also to develop skills of literacy, information technology, etc. Finally, the class test is designed to evaluate your understanding of astrobiology and all content covered in GEOS204 Life, the Universe and Everything.

**Desired Standards**

<b>Grade</b>	<b>Standard Required</b>
High Distinction	Demonstrates an extensive knowledge and understanding of the concepts of the course. Analysis skills are very sophisticated with a balance of individual components and larger ideas. Capable of generalising from examples and evaluating ideas.
Distinction	Demonstrates a thorough knowledge and understanding of the concepts of the course. Analysis skills are sophisticated with a balance of individual components and larger ideas. Capable of generalising from examples and evaluating ideas.
Credit	Demonstrates a sound knowledge and understanding of the concepts of the course. Can break down complex problems into components and synthesise multiple factors into a larger idea. Can evaluate the importance and limitations of data.
Pass	Demonstrates a basic knowledge and understanding of the concepts of the course. Analysis is mainly descriptive. Demonstrates limited capacity to identify complex factors within an idea or to combine multiple factors.
Fail	Demonstrates a limited or poor knowledge and understanding of the concepts of the course. Analysis skills are very limited or mainly descriptive. Demonstrates very limited capacity to identify complex factors within an idea or to combine multiple factors.

**University policy on grading**

Academic Senate has a set of guidelines on the distribution of grades across the range from Fail to High Distinction. Your final result will include one of these grades plus a standardised numerical grade (SNG). On occasion your raw mark for a unit (i.e., the total of your marks for each assessment item) may not be the same as the SNG which you receive. Under the Senate guidelines, results may be scaled to ensure that there is a degree of comparability across the university, so that units with the same past performances of their students should achieve similar results.

It is important that you realise that the policy does not require that a minimum number of students are to be failed in any unit. In fact it does something like the opposite, in requiring examiners to explain their actions if more than 20% of students fail in a unit. The process of scaling does not change the order of marks among students. A student who receives a higher raw mark than another will also receive a higher final scaled mark.

For an explanation of the policy see:

<http://www.mq.edu.au/senate/rules/Guidelines2003.doc>

**Changes since the GEOS204 2010 offering**

Due to the expansion in enrolment of the unit, the format has been changed, with two 1 hour lectures and a 1 hour practical/tutorial to attend each week, instead of a mixed class of 3 hours on one day. A lecture on "Creation Myths" has been dropped, lectures on "Extremeophiles", "Meteorites: The extraterrestrial sample" and "Building blocks of the Solar System" have been added. Practicals/tutorials on meteorites and macroscopic life at 2.1 Ga have been added. Turnitin is now used on geos204.

**Graduate Capabilities**

Students will enter a globalising world of major environmental change and resource constraints, of scientific and technological advance and ethical challenge, of continuing political instability and possible international conflicts, of unlimited creativity and increasing social surveillance. To prepare students for life after university, various graduate capabilities are developed through the curriculum. These capabilities are described below.

No.	Capability	Brief Description
1	<i>Discipline Specific Knowledge and Skills</i>	Graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession.
2	<i>Critical, Analytical and Integrative Thinking</i>	Graduates are to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments.
3	<i>Problem Solving and Research Capability</i>	Graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge.
4	<i>Creative and Innovative</i>	Graduates will be capable of creative thinking and of creating knowledge.
5	<i>Effective Communication</i>	Students develop the ability to communicate and convey their views in forms effective with different audiences.
6	<i>Engaged and Ethical Local and Global citizens</i>	Graduates will have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy.
7	<i>Socially and Environmentally Active and Responsible</i>	Graduates to be aware of and have respect for self and others.
8	<i>Capable of Professional and Personal Judgement and Initiative</i>	Graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement.
9	<i>Commitment to Continuous Learning</i>	Graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake.

### Contacts and Communication

Convener:

**A/Prof Simon George** simon.george@mq.edu.au 9850 4424 E7A 519

Department of Earth and Planetary Sciences, Macquarie University.

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

EPS Admin (if Simon George is not available): E7A 507, phone 9850 6314 or 9850 8373

Other staff teaching on unit and guest lecturers:

**Dr Craig O'Neill** EPS craig.oneill@mq.edu.au 9850 9673 E7A 515

**Dr Bruce Schaefer** EPS bruce.schaefer@mq.edu.au 9859 8368 E7A 506

**Prof Michael Gillings** Biology michael.gillings@mq.edu.au 9850 8199 E8A 271

If sending email, please include GEOS204 in the subject line. We may communicate to you through your STUDENT EMAIL account at Macquarie University. Please make sure you check this email at least weekly.

**GEOS204: Life, the Universe and Everything (2011): Schedule**

Wk	Lecture (Fridays)	Who	Lectures (Y3A T1)	Practicals/tutorials (E5A 132)
<b>Life and The Universe: LEARNING MODULE WEEKS 1-3</b>				
1	25 February 14:00-15:00 15:00-16:00	SCG SCG	Lec. 1: History of the Universe Lec. 2: The Origin of Life	21-25 February (SCG) <b>Introduction to the Unit:</b> web page, plagiarism, referencing.
2	4 March 14:00-15:00 15:00-16:00	SCG CJO	* Ass. 1 issued: Paper Review – due wk 4 Lec. 3: What is Life? Lec. 4: Building a Habitable Solar System	28 February - 4 March (SCG) <b>Group Discussion:</b> Define "life"
3	11 March 14:00-15:00 15:00-16:00	BFS BFS	Lec. 5: Meteorites: The extraterrestrial sample Lec. 6: Building blocks of the solar system	4-11 March (PG) <b>Solar System computer exercise</b> * Ques. Sheet on solar system
			* On-line quiz: lectures 1-6 (open 11/3-18/3)	
<b>Life and Rocks on Early Earth and Mars: LEARNING MODULE WEEKS 4-6</b>				
4	18 March 14:00-15:00 15:00-16:00	CJO SCG	* Ass. 2 issued: ALH84001 table – due wk 7 Lec. 7: Formation and early history of the Earth Lec. 8: Techniques Used in The Search for Life	14-18 March (BFS x PG) <b>Meteorites</b> * On-line quiz on meteorites
	18/3/11, 11am		* Ass. 1 due: Paper Review	
5	25 March 14:00-15:00 15:00-16:00	SCG SCG	Lec. 9: The Search for Life on Mars Lec. 10: Rock identification	21-25 March (PG) <b>Signs of Life podcast and Voyage to the Planets DVD</b> The Search For Life on Mars
6	1 April 14:00-15:00 15:00-16:00	SCG SCG	Lec. 11: Early Life on Earth Feedback: Paper Review, other assessed work	28 March - 1 April (SCG + 2PGs) <b>Rock Practical - week 1</b>
			* On-line quiz: lectures 7-11 (open 1/4-8/4)	
<b>Biology of Life and Habitability: LEARNING MODULE WEEKS 7-9</b>				
7	8 April 14:00-15:00 15:00-16:00	SCG CJO	Ass. 3 issued: Lander Project – due wk 10 Lec. 12: Habitability of Planets and the Co-evolution of Life and its Environment Lec. 13: Environments in the Outer Solar System	4-8 April (SCG x 2 PGs) <b>Rock Practical - week 2</b> * Hand in rock practical sheet
	8/4/11, 11am		Ass. 2 due: ALH84001 table	
2 Week Recess				
8	29 April 14:00-15:00 15:00-16:00	MG MG	Lec. 14: The universal tree of life Lec. 15: Reconstructing LUCA	27-29 April (PG) ♂ <b>Virtual Fieldtrip computer exercise</b> * Ques. Sheet on Virtual Fieldtrip: complete in own time.
9	6 May 14:00-15:00 15:00-16:00	SCG SCG	Lec. 16: Geochemical Biomarker Evidence for Early Life Feedback: ALH84001 table, other assessed work	2-6 May (2 PGs) <b>Macroscopic life at 2.1 Ga?</b> * Ques. Sheet on macroscopic life
			* On-line quiz: lectures 12-16 (open 6/5-13/5)	
<b>Life Elsewhere, SETI : LEARNING MODULE WEEKS 10-12</b>				
10	13 May 14:00-15:00 15:00-16:00	SCG SCG	Lec. 17: Extremophiles Lec. 18: Organic molecules in space	9-13 May (PG) (SCG + 2 PGs) <b>Biomarker practical - week 1</b>
	13/5/11, 11am		Ass. 3 due: Lander Project	
11	20 May 14:00-15:00 15:00-16:00	SCG SCG	Lec. 19: Extra-solar planets Lec. 20: Search for Extra-Terrestrial Intelligence	16-20 May (PG) (SCG + 2 PGs) <b>Biomarker practical - week 2</b> * Hand in biomarker prac sheet
12	27 May 14:00-15:00 15:00-16:00	SCG SCG	Feedback: Lander Project, other assessed work Preparation for class test: format, what to expect	23-27 May (PG) <b>Video: Universe 2001</b> * Ques. Sheet on video
			* On-line quiz: lectures 17-20 (open 27/5-3/6)	
13	3 June 14:00-16:00	SCG +	*** CLASS TEST (30%) *** 14:15 to 15:45 (1.5 hours), in Y3A T1 and E5A 132 (TBC)	

\* SCG= A/Prof Simon George (EPS, convener), BFS = Dr Bruce Schaefer (EPS), CJO = Dr Craig O'Neill (EPS), MG - Prof Michael Gillings (Biol), PG = postgraduate demonstrators.

♂ 25 and 26 April are public holidays. Those in the Monday and Tuesday prac/tut class please come to one of the other classes in week 8. We may run extra practical/tutorial classes on Friday of week 8.