

Geology 9564a, Basin Analysis & Sequence Stratigraphy

Time, Place

Fall Term. Day to be assigned, depending on TA duties of participants. Three hours, lecture and laboratory session combined. Room to be assigned.

Prerequisites.

This is a graduate level only course, and pre-supposes a working knowledge of sedimentary processes, depositional environments and facies; plate tectonics, structural geology and a little geophysics.

Instructor: Dr. A. G. Plint. Rm 1072, B&G building, gplint@uwo.ca

Outline

Basin Analysis is many things to many people! However, most workers would now agree that Basin Analysis is fundamentally concerned with i) *Subsidence History*, and ii) *Paleogeographic Evolution* of a sedimentary basin. These aspects are investigated primarily through the disciplines of stratigraphy, sedimentology, structural geology and geophysics.

Lectures In order to understand the *fill* of a sedimentary basin, it is first important to review the basic physical properties of the lithosphere, and the mechanisms by which large chunks of the lithosphere are made to subside in order that sediments may accumulate. In view of this, the first part of the course will consider **Lithospheric Rheology**, followed by a discussion of the **Main Basin Types** in their plate-tectonic context.

The second theme of the course will concern **Stratigraphy**. In this section, I will look at some of the important ideas in this field, including Depositional Systems and Systems Tracts, Chronostratigraphic methods, Seismic Stratigraphy, Sequence Stratigraphy and Stratigraphic Cyclicality. These aspects are very important because they allow the basin analyst to define a *time stratigraphy* for the basin. This is an essential prerequisite to any sort of paleogeographic analysis, and is also critical in analysis of relative sea level changes. Key slides from lectures will be posted to the class website before each class.

In this course, I make the assumption that students will have a working understanding of plate tectonics, sedimentary processes, facies analysis, seismic methods, and of well logging methods.

Lab Work We will examine a number of practical problems during the labs. I will utilise a number of classic seismic sections in order to attempt some seismic stratigraphic analyses. We will also undertake one or more sequence stratigraphic exercises where the basic character of key stratigraphic

surfaces, systems tracts, and chronostratigraphy will be explored.

Term Paper. Each student in the course will choose a topic to investigate, based on published literature. Results are to be presented in the format of a scientific review paper (e.g. *Journal of Sedimentary Research*), and each paper should *not exceed* 15 typed, double-spaced pages, including a 300 word Abstract; Figures and References do not count in the 15 page limit. Each paper will be reviewed and edited by the instructor, and each student will be invited to discuss comments on their essay in a personal tutorial session. A summary of your findings will be presented to the class in an approximately 20 minute talk. This paper and presentation will collectively form the basis for 60% of your course mark. Papers will be submitted as hardcopy, and also as electronic WORD document for possible checking by *Turnitin* software (see 'Academic Offences' below). A formal examination, potentially covering all aspects of the lecture and lab material, will be set at a convenient time after the end of term.

Evaluation

Term paper (50%) + talk (10%) = 60% of mark

Final Exam: = 40% of mark

Academic Offences:

“Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: <http://www.uwo.ca/univsec/handbook/appeals/scholoff.pdf> .”

“All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).”

Absence from Exams

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean's office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately. For further information please see:

<http://www.uwo.ca/univsec/handbook/appeals/medical.pdf>

Accommodation due to Illness

A student requiring academic accommodation due to illness, should use the Student Medical Certificate when visiting an off-campus medical facility or request a Records Release Form (located in the Dean's Office) for visits to Student Health Services.

The form can be found here:

https://studentservices.uwo.ca/secure/medical_document.pdf

Accessibility

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

Books There are some good summary texts available, and I recommend these as a good source of additional references when researching your topics. The first two listed below are probably the best.

Tectonics of Sedimentary Basins, edited by Cathy J. Busby & Raymond V. Ingersoll. 1995, Blackwell Science, 579 p. QE571.T355

Principles of Sedimentary Basin Analysis (2nd Ed.), Andrew Miall, 1990. Springer-Verlag, 669 p. QE471.M44. By way of introduction to the field of basin analysis, I strongly recommend reading chapter 1 of this book.

The Geology of Stratigraphic Sequences, Andrew Miall, 2010. Springer Verlag, 522 p. QE651.M46.
Basin Analysis - principles & applications, P.A. Allen & J.R. Allen. 2005, 2nd Ed.. Blackwell Science, 549 p. QE571.A45

Sedimentary Basins, evolution, facies and sediment budget. Gerhard Einsele, 1992. Springer-Verlag, 628 p. QE751.E36.

New Perspectives in Basin Analysis, edited by Karen Kleinspehn & Chris Paola. 1988 Springer-Verlag, 453 p. QE571.N39. (This is not so much a text book as a collection of papers on various aspects of basin analysis).

Sedimentary Environments and Facies, edited by Harold G. Reading, 2nd edition, Blackwell Scientific Publications, 615 p. This book contains a useful chapter (14) on 'Sedimentation and Tectonics' (unfortunately dropped from the 3rd (1996) edition of this classic book). QE571

Tectonics of sedimentary basins: Recent advances, edited by Cathy Busby and Antonio Azor, 2012, Wiley-Blackwell, 647 pp. (Online book available in library).