

**THE UNIVERSITY OF WESTERN ONTARIO  
DEPARTMENT OF GEOGRAPHY**

**GEOGRAPHY 3350A: ENVIRONMENTAL CHANGE (2012)**

**Calendar Description:** The evidence, causes and chronology of environmental change with particular emphasis on the Holocene in North America.

**Prerequisite(s):** Third or fourth year status at the University including at least one of [Geography 2310A/B](#), [2320A/B](#) and [2330A/B](#).

**Instructor:** Dr. B.H. Luckman, Room 1420 Social Science

**Course Timetable:** Tuesdays 0830-1030 SSC 2333  
Thursdays 0830-1030 SSC 2333

**Final Examination:** 3 hours, TBA, December 2012

**Course content**

This course deals with natural environmental changes with a primary focus on the last 2 millennia. It does not directly address the questions of anthropogenically-induced changes and possible future scenarios but is explicitly designed to provide background to these issues. The philosophy behind this approach is that;

- understanding and appreciation of past environmental changes and the response of natural systems to them is intrinsically interesting, and;
- developing an understanding of past changes, their causes and effects, is the best way to be able to predict the likely response of global (and local) environmental systems to future changes that will probably be controlled by anthropogenic influences.

There will be some discussion of anthropogenic changes in the latter part of the course but this will not be its primary focus. The range of topics to be covered is large and a brief outline is appended.

**Course organisation**

The course is timetabled as two, 2 hour blocks which will be used mainly for lecture and seminar presentations. The course will be structured around two primary blocks each with ca. four weeks of lectures and two weeks of student presentations. There will also be one formal laboratory assignment in the first weeks of the course. Because of the diverse nature of the materials and student interest in this course some considerable focus will be given to student presentation of material. Students should expect to make two presentations within the course.

**Prerequisite checking:**

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

## Assignments

### Assignment 1; Global temperature Records. Assigned September 11, Due September 25

This assignment will review global and Canadian instrumental temperature records using available data sources.

### Assignments 2 and 3

For assignments 2 and 3 the topics will be selected or assigned from a list provided by the instructor or negotiated with the student. The first topic will deal with techniques of investigation (dating or paleoenvironmental reconstruction); the second may deal with a report focused on a selected region, time frame or major control of climate change or identification of the work of a specific researcher or research group.

The likely timing for these assignments is as follows:

#### Assignment 2: Techniques of Paleoenvironmental Study

Assigned       **September 20**  
Presentations **October 11-23**  
Paper due       **October 25**

#### Assignment 3: Records of Environmental Change

Assigned       **October 25**  
Presentations **November 22-29 (probable)**  
Paper due       **December 4**

**Presentations** will occur during class time in consecutive classes. The number of sessions will depend on course enrolment and therefore the schedule is subject to revision once final course numbers are known. Each two-hour session will follow a standard conference format and students will be expected to submit a formal paper a short time after their presentation. Once the topic is assigned and scheduled the student is responsible for:

**(i) The preparation of a one page typed abstract** (maximum 200 words) with one or two key references. This will be circulated in the class prior to the presentation (i.e. is due one class before you present).

**(ii) A 15-20 minute presentation** followed by 5 minutes of questions in the scheduled time slot.

**(iii) A typed paper** (maximum 2500 words) submitted after the presentation. Presentations will be run under a standard conference format chaired by the instructor with up to ca. 5-6 presentations in each two hour slot. The presentations are regarded as an integral part of course content.

### GRADING

**Final 3 hour examination 40%**

**Assignment 1 15%**

**Assignment 1 25% (10% presentation; 15% essay)**

**Assignment 2 20% (10% presentation; 10% essay)**

### Grading of assignments

Each student presentation will be assigned a grade for both presentation and content by the instructor and all students present at the "conference session" in which the material is presented. It is anticipated that average grade awarded will be in the B- to B range. Each student will receive a final grade (10%) based on the average of the student-awarded grades and the instructor's grade (each weighted at 50%). The completed assignment will be graded by the instructor and awarded a grade equivalent to 15% (assignment 2) or 10% (assignment 3) of the final course mark.

## Reading materials

Selected reading materials may be made available in Room SSC1422 (Dendrogeomorphology Lab) or from the instructor. Access to 1422 will be provided during normal working hours. Materials and readings should not be removed from Room 1422.

### Texts

The subject matter of this course is very extensive and broad ranging since, in order to understand environmental/ climate change, it is necessary to have some integrative understanding of

- (i) The present climate and other natural environmental systems
- (ii) The forcing functions that control those systems
- (iii) The chronology of past environmental changes
- (iv) The techniques used to reconstruct paleoenvironments and their limitations (including dating techniques)
- (v) Anthropogenic influences on local and global environments

The associated reading material is extensive and there is no ideal, easily accessible package of material that will cover the subject matter treated in this course. **Bradley (1985, 1999)** and **Mackay et al (2003)** are the most useful books on techniques. **Ruddiman (2007)** is the most useful general overview. A limited number of copies of the second edition of Bradley and **Ruddiman** are in the bookstore and would be a useful sources for the first half of the course. The ideal text would be a combination of **Bradley 1999, Bradley and Jones 1992, Jones et al., 1996 and Soloman et al (IPCC) 2007, Burroughs 2003, Alverson et al., 2003, Mackay et al, 2003**. The most useful source for individuals will vary with their interest and focus within the area of environmental change. Books that contain much useful and relevant information include;

Alverson, K.D., Oldfield, F. and Bradley, R.S. (Eds) 2000 Past Global Changes and their Significance for the Future. Quaternary Science Reviews 19, parts 1-5, 1-479.

Alverson, K.D., Bradley, R.S. and Pederson, T. 2001 Environmental Variability and Climate Change, IGBP Science no. 3, 31p (IGBP, Stockholm).

\* Alverson, K.D., Bradley, R.S. and Pederson, T. 2003 Paleoclimate, Global Climate and the Future. The IGBP Global Change Series, Springer-Verlag, 221 pages.

Beniston, M. 1994 Mountain Environments in Changing Climates. Routledge, London.

Bowen, D.Q. 1978 Quaternary Geology. Oxford University Press.

Bradley, R.S. 1985 Quaternary Paleoclimatology. Methuen. An extremely useful source which covers the methods and techniques used in paleoclimate studies. It has become a little dated but you will find it a most useful source that is closely followed in some sessions.

\* Bradley, R.S. 1999 Quaternary Paleoclimatology, 2nd Edition, Academic Press, 623p

Bradley, R.S. (Ed), "Global Changes of the Past", UCAR, Office of Interdisciplinary Research, Boulder, Colorado.

Bradley, R.S. and Jones, P.D. 1992 *Climate since AD 1500*. Routledge, New York. (A revised, paperback edition was published in 1995 with a new concluding chapter)

\* Burroughs W. (Ed) 2003 *Climate into the 21<sup>st</sup> century*. Cambridge University Press for the World Meteorological Organisation., Cambridge, 240 pages

Dawson, A.L. 1992 *Ice Age Earth: Late Quaternary Geology and Climate*. Routledge, London.

Dean, J.S., Meko, D.M. and Swetnam 1996 *Tree-Rings, Environment and Humanity*. Radiocarbon 1996, Tucson.

Economist, 1990 *Climate Change*, Economist 7-13 April 1990 pages 13, 95-100. A very good general layman's review.

GEOS, 1989 Volume 10, 3: Special Issue on global climate change issues from a geologic perspective; various articles

Goudie, A. 1990 *The Human Impact on the Natural Environment*. Oxford University Press.

Goudie, A. 1993 *Environmental Change*. Oxford University Press. 329 pages (3rd edition, earlier editions may also be useful)

Grove, J. 1987 *The Little Ice Age*. Cambridge University Press. (Second Edition 2003?)

Houghton, J.T., Jenkins, G.J., and Ephraums, J.J. 1990 *Climate Change the IPCC Assessment*, Cambridge University Press.

Houghton, J.T., Callander, B.A., and Varney, S.K. 1992 *Climate Change 1992. The supplementary Report to the IPCC Scientific Assessment*. Cambridge University Press.

Houghton, J.T., Meira Filho, L.G., Callander, B.A., Harris, N., Kattenberg, A., and Maskell, K. 1996 *Climate Change 1995* Cambridge University Press.

\* Houghton, J.T., Ding.Y., Griggs, D.J., Noguer, M., van der Linden P.J., Dai, X., Maskell, K. and Johnson, C.A. 2001 *Climate Change 2001: The Scientific Basis*, Cambridge Univ. Press 881p.

Hughes, M.K. and Diaz, H.F. (Eds) 1994 *The Medieval Warm Period*. Kluwer Academic Dordrecht/Boston/London. (Reprint of *Climate Change* 26, volume 2)

Imbrie, J. and Imbrie, K.P. 1979 *Ice Ages, Solving the mystery*. Harvard University Press, Cambridge, Mass. A science writer's award winning account of the search for the causes of Ice Ages.

Jones, P.D., Bradley, R.S. and Jouzel, J. 1996 *Climatic Variations and Forcing Mechanisms of the Last 2000 Years*. NATO ASI Series Vol 1 No. 41. Springer Verlag, Berlin.

Lamb, H.H. 1977 Climate Past Present and Future- Volume 2 Climatic History and the Future, Methuen. The Classic reference

\* Mackay A., Bataarbee, R., Birks, J. and Oldfield, F. 2003 Global Change in the Holocene. Edward Arnold, London, 528p

Markgraf, V. 2001 Interhemispheric Climate Variability, Academic Press, New York.

Mikami, T. 1992 Proceedings of the International Symposium on the Little Ice Age Climate. Department of Geography, Tokyo Metropolitan University, Japan.

McCarthy, J.J., Canziani, O.F., Leary N.M., Dokken, D.J. and White K.S. (eds) 2001 Climate Change 2001: Impacts, Adaptation and Vulnerability. Cambridge Univ. Press, 1032 p.

Oldfield Frank, 2005 Environmental Change. Key Issues and Alternative Approaches. Cambridge University Press, 363p.

Oerlemans, J. (ed) 1989 Glacier Fluctuations and Climatic Change. Kluwer Academic, Dordrecht.

Roberts, N. 1989 The Holocene: An Environmental History. Oxford University Press.

\* Ruddiman, W.F. 2007 Earth's Climate: Past and Future. W.H. Freeman, New York, 2<sup>nd</sup> Edition

Ruddiman, W.F. and Wright, H.E. (Eds) 1987 North America and Adjacent Areas during the Last Deglaciation. Geological Society of America, Boulder, Colorado.

\* Solomon, S. et al 2008 Climate Change 2007: The Physical Science Basis ( 4<sup>th</sup> TAR aka IPCC Report Volume 1), Cambridge University Press.

Turner, B.L.II, Clark, W.C., Kates, R.W., Richards, J.F., Mathews, J.T., and Meyer, W.B. 1990 The Earth as Transformed by Human Action. Cambridge University Press.

Warner, B.G. (Ed) 1990 Methods in Quaternary Ecology. Geoscience Canada Reprint Series #5, Geological Association of Canada.

Watson, R.T., Zinyowera, M.C., Moss, R.H. (Eds) Climate Change 1995. Impacts, Adaptions and Mitigation of Climate Change: Scientific-Technical Analyses. Cambridge Univ. Press.

Wigley, T.M.L., Ingram, M.J., and Farmer, G. (Eds) 1981 Climate and History. Cambridge University Press, Cambridge

### **Web Sites**

There are a very large number of institutional and personal web pages that contain information relevant to this course. Some of the more important ones include the

<http://www.wmo.ch/index-en.html> World Meteorological Organisation

<http://www.ngdc.noaa.gov/paleo/> World Data Center for Paleoclimatology (NOAA USA)

<http://www.pages.unibe.ch/> IGBP PAGES The Paleo section of the Global Change Program

<http://www.igbp.kva.se/cgi-bin/php/frameset.php> IGBP Program main office in Stockholm

<http://www.msc-smc.ec.gc.ca/> Meteorological Service of Canada

<http://www.cru.uea.ac.uk/> Climate Research Unit, University of East Anglia, UK

**Plagiarism:**

Students must write their essays and assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence (**see Scholastic Offence Policy in the Western Academic Calendar**)."

For UWO Policy on Accommodation for Medical Illness see:

[http://www.uwo.ca/univsec/handbook/appeals/accommodation\\_medical.pdf](http://www.uwo.ca/univsec/handbook/appeals/accommodation_medical.pdf) Downloadable

Student Medical Certificate (SMC) at : <https://studentservices.uwo.ca> under the Medical

Documentation heading.

No electronic devices will be permitted in the final examination.

The attached schedule is tentative and subject to change depending on student enrolments and other factors. It may be updated later.

# Geography 3350A outline fall 2012

		<b>Assignments</b>
		assigned due
<b>Sept</b>	<b>6</b> Introduction, rationale and environmental history	
	<b>11</b> Techniques 1: documentary and instrumental records	
	<b>13</b> Techniques 2: dating, timescales and environmental change	<b>global temperatures</b>
	<b>18</b> Techniques 3: Ice cores	
	<b>20</b> Techniques 4: Dendrochronology ( tree rings)	<b>Assign 2</b>
	<b>25</b> Tree ring lab	tree ring l: assign 1
	<b>27</b> Techniques 5: Ocean cores and other data	
<b>Oct</b>	<b>2</b> no class	
	<b>4</b> Environmental changes: Pleistocene and glacial history	
	<b>9</b> Environmental changes: Younger Dryas	
	<b>11</b> Techniques 6: Pollen	
	<b>16</b> Student presentations ( techniques)	Assign 2
	<b>18</b> Student presentations ( techniques)	Assign 2
	<b>23</b> Student presentations ( techniques)	Assign 2
	<b>25</b> Environmental changes: Holocene	<b>assign 3</b> Essay
	<b>30</b> Environmental changes: the last millennium & Little Ice Age	
<b>Nov</b>	<b>1</b> Little Ice age continued / 20 <sup>th</sup> century	
	<b>6</b> Techniques 7: Diatoms and paleolimnology	
	<b>8</b> Climate forcing factors orbital variation	
	<b>13</b> Causes of climate changes; volcanism, solar	
	<b>15</b> Oceanic and atmospheric forcing ( el Nino, PDO)	
	<b>20</b> Climate forcing factors Anthropogenic Factors	
	<b>22</b> student presentations	Assign 3
	<b>27</b> student presentations	Assign 3
	<b>29</b> student presentations	assign 3
<b>Dec</b>	<b>4</b> Concluding remarks	assign 3 written
	<b>Exam Period; Final examination ( 3 hours)</b>	