



University of
Leicester

**School of Archaeology &
Ancient History**

AR3066 **The Archaeology of Climate Change**

Academic Year: **2009-2010**

Semester: **2**

Time and location: Wednesdays 10 – 12. ATT 204

First meeting: Wednesday 27th January 2010

Module coordinator: Dr Jago Cooper

e-mail: jc329@le.ac.uk

Room: Attenborough Tower 1615

Office hours: Wednesday 2 - 4 pm

*Your individual appointments
(e.g. tutorials, seminars):*

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document prepared by: Jago cooper 05/03/2009

AR3066 The Archaeology of Climate Change

Weighting: 20 credits

Coordinator: Dr Jago Cooper

Other tutors:

Module outline: This course will review how planetary climate change has impacted upon the development of human societies. Students will learn how climate systems function and how long term global climate change can result in abrupt short term local environmental change. The course will utilize case studies from archaeological sites around the world to follow the development of the human species from the emergence of Homo sapiens in East Africa to the impacts of industrialization in 19th Century northern Europe. This course will enable students to consider the likely impacts of human induced climate change in the 21st century by understanding the influence of naturally occurring climate change on past societies in different environmental contexts around the world.

Aims: The module aims to build on students existing knowledge of archaeology and paleoenvironments to provide grounding in:

- The techniques available to study past climate change
- The archaeological study of human environment relations
- Research skills and methodologies used to study past human experience of climate change

Intended learning outcomes: By the end of the course, students should be able to:

- demonstrate knowledge and understanding of the nature of global climate systems and the relationship with environmental change at different spatial and temporal scales
- demonstrate knowledge and understanding of past climate change
- critically evaluate competing theoretical approaches to studies of human environment relations
- research a well-define topic and communicate the results effectively in a presentation
- demonstrate appropriate knowledge and understanding of Earth's climate and the impact on past human societies
- critically evaluate archaeological and paleoenvironmental data and produce independent comparative interpretations

Method(s) of teaching: Nine two-hour meetings combining lectures and seminars.

Method of assessment:

1. A critical essay analysing recent research on a set theme (max. 3,000 words: 50%)
2. An Exam (2 hrs: 50%)

Teaching Schedule

<i>Week 14</i> <i>27th January</i>	Lecture 1: Earth's Climate Systems: Past, Present and Future.
<i>Week 15</i> <i>3rd February</i>	Lecture 2 Thinking about Environment, Ecology and Ecodynamics: What is Nature? What is Culture?
<i>Week 16</i> <i>10th February</i>	Lecture 3 Surviving Climate Change in the Paleolithic: Lessons from Africa, Asia and Europe
<i>Week 17</i> <i>17th February</i>	Lecture 4 Populating the Planet: The Comparative Roles of Climate and Culture
<i>Week 18</i> <i>25th February</i>	Lecture 5 Origins of Civilization: The Role of Climate in the Development of Complex Societies
<i>Week 19</i> <i>3rd March</i>	Reading Week
<i>Week 20</i> <i>10th March</i>	Lecture 6 Climatic Stress and Social Response: Comparative Lessons from the Ancestral Puebloan and Viking Communities
<i>Week 21</i> <i>17th March</i>	Lecture 7 Learning to Live with the Environment: Climate Change Profiteering and Environmental Opportunism
<i>Week 22</i> <i>24th March</i>	Lecture 8 Making of the Modern Epoch: The Dawn of the Anthropocene?
<i>Week 23</i> <i>5th May</i>	Lecture 9 Lessons from the Past for Problems of the Future: Only Archaeologists can Save the World

Assignments and Deadlines

1. Exam (50%) The exam will consist of a choice of detailed case study question based on the material covered in the course. Time allowed: two hours.
2. Essay (50%), 3, 000 words max. Deadline: **Monday 3rd May 2010**

Essay topics: you are encouraged to develop your own essay topic, but you **MUST** discuss it with module coordinator before **1st March 2010**.

Should you require an essay topic to be provided please let me know before **1st March 2010**

Detailed Course Schedule

Week 14

Lecture 1

Earth's Climate Systems: Past, Present and Future.

Time: 4.5 Billion BP to Present

Space: Earth's Universe

Key Themes: Earth's Climate Systems, Climate Change, Chronological Frameworks, Environmental Impacts, Climatic Instability

Overview: This lecture will provide an overview of the fundamentals of the Earth's climate. Students will gain an understanding of the nature of environmental change and the spatial and temporal scales at which cause and effect occur within planetary ecosystems. Chronological frameworks based on geological and isotopic data will be reviewed. The role of modelling will be discussed with particular reference to the potential role of archaeology in ground truthing retrodictive models.

Seminar 1

This seminar will allow students to discuss how changes in global climates can impact on local environments. Students will identify and discuss the key hazards that face human communities living with the impacts of environmental change. There will be a particular focus on 'tipping points' where long-term cause can result in short-term consequence.

Week 15

Lecture 2

Thinking about Environment, Ecology and Ecodynamics: What is Nature? What is Culture?

Time: 500 BC – Present

Space: Predominantly European and North American Literature

Key Themes: Theory, Environmental Determinism, Biogeography, Human Ecology, Environmental Activism

Overview: This lecture will extract some key themes from the theoretical debates surrounding environmental change and human ecodynamics. We will cover the topics that are key to understanding the nature of human engagement with the impacts of climate change. These will include human ecology, environmental change, scales of temporality and space, coping strategies, resilience, sustainability, rigidity traps, adaptation, Traditional Ecological Knowledge (TEK). These key themes will be used to structure the investigation of each of the case studies raised

later in the course and thus enable students to develop and defend their own theoretical positions on human environment relations.

Discussion Seminar 2

Students will discuss the reading they have read during the previous week and give their own opinions on the nature of human environment relations. Students will show off their newfound knowledge and insightful opinion in a round table discussion.

Week 16

Lecture 3

Surviving Climate Change in the Paleolithic: Lessons from Africa, Asia and Europe

Time: 1.8 Million Years BP – 28,000 Years BP

Space: Africa, Asia, Europe

Key Themes: Cognitive Development, Social Networks, Decision Making

Overview: In this lecture students will review the influence of climatic changes on the emergence of early modern humans. The relative ability of *Homo sapiens* to deal with the impacts of climate change will be discussed in comparison to Neanderthals and other early Hominins. Case studies from Africa, Asia and Europe will be covered and themes of cognition and human ecology will be discussed.

Discussion Seminar 4

Discuss reading and debate the nature of long-term Hominin interaction with the impacts of climate change. Consider the role of social networks as coping mechanism for ecological stress.

Week 17

Lecture 4

Populating the Planet: The Comparative Roles of Climate and Culture

Time: 50,000 BP – 5000 BP

Space: North America, South America, Small Island States

Key Themes: Colonization, Migration, Sea-Level Change, Hunter-Gatherers, Big Game Hunting. Extinction, LGM, Younger Dryas, Genetics

Overview: This lecture will look at human colonization of the planet from 50,000-500 BP. We will investigate the comparative importance of environmental opportunism, where people took advantage of newly created opportunities for colonization during past periods of climate change, and socio-technological developments that enabled human groups to expand the range of habitable

environments into which they could migrate. Key issues of colonization, migration and environmental change will be discussed using case studies from North America, Australasia and different Island Archipelagos around the world.

Student Led Seminar 5

Week 18

Lecture 5

Origins of Civilization: The Role of Climate in the Development of Complex Societies

Time: 6000 BP – 2000 BP

Space: North Africa, Near East, South Asia

Key Themes: Climatic Instability, Social Dynamics, Human Ecology, Human Impact, Developmental Rigidity, Demography

Overview: This Lecture will explore the role of climatic change on the development of agriculture. Exploring in detail the transient role between human societies and plant/animal domestication, this lecture will assess the role that the relative stability of climate plays in the development of large-scale human societies.

Student Led Seminar 6

Week 19

Reading Week

Week 20

Lecture 6

Climatic Stress and Social Response: Comparative Lessons from the Ancestral Puebloan and Viking Communities

Time: AD 600 – AD 1800

Space: North Atlantic, North America

Key Themes: Collapse scenarios, Social Coping Mechanisms, Rigidity Traps, Resilience, Environmental Disaster, Catastrophe and Migration

Overview: In this lecture we will evaluate how past human societies developed rigidity traps that restricted their ability to cope with the impacts of climate change. The impact of periodic droughts on the Ancestral Puebloan communities in the Southwest USA will be investigated using high resolution dendrochronology dating and environmental evidence. Comparisons will be drawn with the Viking communities of the North Atlantic where periods of environmental change put stress on resource and subsistence practices. These case studies will be evaluated in light of last week's case studies from South and Central America leading to discussion of the key lessons that can be learnt from these archaeological investigations.

Student Led Seminar 7

Week 21

Lecture 7

Learning to Live with the Environment: Climate Change Profiteering and Environmental Opportunism

Time: AD 150– AD 1450

Space: South America, Central America

Key Themes: Water Management Systems, Social Hierarchies, Resource Control, Resilience, Social Flexibility

Overview: This lecture will use case studies from South and Central America to explore the way in which past societies were able to capitalize on periods of climatic stability and instability. The development of social networks and technological packages that were harmonized with local environmental conditions and that could cope with regional climate change will be covered. Students will be able to assess what lessons these past communities can teach us regarding the control of resources during times of climatic instability.

Student Led Seminar 7

Week 22

Lecture 8

Making of the Modern Epoch: The Dawn of the Anthropocene?

Time: AD 1450 – AD 1970

Space: Americas, Europe, Africa

Key Themes: Industrial revolution, Culture Change, Diasporas, Anthropocene,

Overview: In this lecture we will discuss the consequences of the industrial revolution on global demography and human ecodynamics. The relationship between environmental resources, energy consumption and social development will be considered using case studies from Europe and North America. We will study how the differential development of societies around the world has affected the relative ability of these societies to cope with the impacts of climate change.

Student Led Seminar 8

Lessons from the Past for Problems of the Future: Only Archaeologists can Save the World

Space: Caribbean

Time: 6000 BP – Present

Key Themes: Mitigation Strategies, Disaster Management Planning, Education, Inter-Disciplinary Approaches, Policy Making

Overview: This lecture will evaluate whether archaeologists can contribute to debates and policy forums discussing preparations for the impacts of modern day climate change. The role of archaeology in the development of national and international mitigation strategies will be considered using a case study from the Caribbean. The key messages from this course will be drawn out and students will have an opportunity to display their wisdom and share their thoughts on Earth's Climate Systems Past, Present and Future.

Revision Seminar 9

One-hour revision seminar in preparation for the exam

Weekly Readings and Wider Bibliography

Further reading suggestions on any related topic are available on request!

Key Module Texts

Crate, S.A. and Nuttall, M. (eds) 2009 *Anthropology and Climate Change: from Encounters to Actions*. Left Coast Press.

IPCC. 2007. *Climate Change 2007: The Physical Science Basis*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.

Lowe, J.J. and Walker, M.J.C. 1997 *Reconstructing Quaternary Environments*. (2nd edition) Addison Wesley Longman: Harlow.

Roberts, N. 1998 *The Holocene: an Environmental History* (2nd edition) Blackwell Publishing: Oxford.

Ruddiman, W.F. 2005 *Plows, Plagues and Petroleum: How Humans Took control of Climate*. Princetown University Press: Princetown.

Additional Module Reading

Fagan, B. 2004. *The Long Summer: How Climate Changed Civilization*. London: Granta Books.

Lamb, H. H. 1982. *Climate, History and the Modern World*. New York: Methuen.

Maslin, M. 2004. *Global Warming: A very short introduction*. Oxford: Oxford University Press.

Richards, J. F. 2005. *The Unending Frontier: An Environmental History of the Early Modern World*. London: University of California Press.

Simmons, I. G. 2001. *An Environmental History of Great Britain: from 10,000 years ago to the present*. Edinburgh: Edinburgh University Press.

Williams, M., Dunkerley, D., De Dekker, P., Kershaw, P., and Chappell, J. 1998 (2nd edition) *Quaternary Environments*. Hodder Arnold: London.

Lecture 1

Key Texts

Crate, S. 2008. Gone the Bull of Winter? Grappling with the Cultural Implications of and Anthropology's Role(s) in Global Climate Change. *Current Anthropology* 49:569-595

IPCC. 2007. Climate Change 2007. Synthesis Report: Summary for Policy Makers. Cambridge University Press.

IPCC. 2007. Climate Change 2007: *The Physical Science Basis*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press. (CHAPTER 6)

Lowe, J.J. and Walker, M.J.C. 1997. *Reconstructing Quaternary Environments*. Second edition. London: Longman. (CHAPTER 1)

Maslin, M. 2004. *Global Warming: A very short introduction*. Oxford: Oxford University Press.

Wilson, R. C. L., S. A. Drury, and J. C. Chapman. 2000. *The Great Ice Age: Climate Change and Life*. London: Routledge.

Williams, M.A.J., Dunkerley, D.L., De Deckker, P., Kershaw, A.P. and Stokes, T. 1993. *Quaternary Environments*. London: Edward Arnold. (CHAPTER 1)

Lecture 2

Key Texts

Crate, S., and M. Nuttall. 2009. "Introduction: Anthropology and Climate Change," in *Anthropology and Climate Change: from Encounters to Actions*. Edited by S. Crate and M. Nuttall, pp. 9-36. Walnut Creek, CA: Left Coast Press.

Huntington, H., T. Callaghan, S. Fox, and I. Krupnik. 2004. Matching Traditional and Scientific Observations to Detect Environmental Change: A Discussion on Arctic Terrestrial Ecosystems. *Ambio* 33:20-25.

Lenton, T. M., H. Held, E. Kriegler, J. W. Hall, W. Luch, S. Rahmstorf, and H. J. Schellnhuber. 2008. Tipping elements in the Earth's climate system. *PNAS* 105:1786-1793.

Peterson, N., and K. Broad. 2009. "Climate and Weather Discourse in Anthropology: from Determinism to Uncertain Futures," in *Anthropology and Climate Change: from Encounters to Actions*. Edited by S. Crate and M. Nuttall, pp. 70-86. Walnut Creek, CA: Left Coast Press.

Additional Reading

Crate, S. 2006. Elder Knowledge and Sustainable Livelihoods in Post-Soviet Russia: Finding Dialogue across the Generations. *Arctic Anthropology* 43:40-51. (PDF Available)

Crumley, C. L. 1994. "Historical Ecology: A multidimensional ecological orientation," in *Historical Ecology: Cultural Knowledge and Changing Landscapes*. Edited by C. Crumley, pp. 1-7. Santa Fe: School of American Research Press.

Goudie, A., and H. Viles. 1997. *The Earth Transformed: An introduction to Human Impacts on the Environment*. Oxford: Blackwell Publishers.

Jones, G. 2004. *People an Environment: A Global Approach*. London: Pearson.
(CHAPTER 2)

Mahoney, A., S. Gearheard, T. Oshima, and T. Qillaq. 2009. Sea Ice Thickness Measurements from a Community-Based Observing Network. *BAMS*.

McIntosh, R. J., Tainter J. A., and McIntosh, S. K. 2000. "Climate, history and human action," in *The Way the Wind Blows: Climate, History, and Human Action*. Edited by R. J. McIntosh, Tainter J. A., and McIntosh, S. K., pp. 1-42. New York: Columbia University Press.

Lecture 3

Key Texts

Gamble, C.S. 1995. The earliest occupation of Europe: the environmental background. In: *The Earliest Occupation of Europe* (eds W. Roebroeks & T. Van Kolfschoten), pp. 279-295.

Hoffecker, J. F. 2005. Innovation and Technological Knowledge in the Upper Paleolithic of Northern Eurasia. *Evolutionary Anthropology* 14:186-198.

Hoffecker, J. F. 2009. The spread of modern humans in Europe. *PNAS* Unpublished Proof:1-6.

Mellars, P. 1998. The Upper Palaeolithic revolution. In: *Prehistoric Europe: an illustrated history* (ed. B. Cunliffe), pp. 42-78 (especially pp. 42-59). Oxford: Oxford University Press.

Additional Reading

Gamble, C. 1998. The peopling of Europe 700,000-40,000 years before the present. In: *Prehistoric Europe: an illustrated history* (ed. B. Cunliffe), pp. 5-41 (especially from page 16 onwards). Oxford: Oxford University Press.

Gamble, C. 1993. *Timewalkers. The Prehistory of Global Colonization*. Stroud: Alan Sutton. (CHAPTER 8 & 9).

Van Andel, T.H. & Tzedakis, P.C. 1996. Palaeolithic landscapes of Europe and environs, 150,000-25,000 years ago: an overview. *Quaternary Science Reviews* 15: 481-500.

Lecture 4

Key Texts

Bell, M. and Walker, M.J.C. 1992. *Late Quaternary environmental change: physical and human perspectives*. Pages 148-154. London: Longman.

Clarke, G., D. Leverington, J. Teller, and A. Dyke. 2003. Superlakes, Megafloods, and Abrupt Climate Change. *Science* 301:922-923.

Goudie, A. 2000. *The Human Impact*. Oxford: Blackwell.

Additional Reading

Diamond, J.M. 1989. The present, past and future of human-caused extinctions. *Philosophical Transactions of the Royal Society of London*, B 325: 469-477. 12

Fagan, Brian 1995. *Ancient North America. The Archaeology of a Continent*. Second Edition London: Thames and Hudson.

Grayson, D.K. 2001. The archaeological record of human impacts on animal populations. *Journal of World Prehistory* 15: 1-68.

Masson V.M. 1992. The environment. In A.H. Dani and V.M. Masson, eds., *The Dawn of Civilization: Earliest Times to 700 B.C.*, pp. 29-44; 484-485. Paris:UNESCO.

Lecture 5

Key Texts

Barich, B. 2002. "Cultural Responses to Climatic Changes in North Africa: Beginning and Spread of Pastoralism in the Sahara," in *Droughts, Food and Culture: Ecological Change and Food Security in Africa's Later Prehistory*. Edited by F. A. Hassan, pp. 209-223. New York: Plenum Publishers.

Dirks R. 1980. Social responses during severe food shortages and famine. *Current Anthropology* 21: 21-44.

Roberts, N. 1998. *The Holocene. An environmental history*. Second edition. Oxford: Blackwell. Pages 81-86.

Additional Reading

Halstead P., and O'Shea J. 1989. Cultural responses to risk and uncertainty. In P.Halstead and J. O'Shea, eds., *Bad Year Economics: Cultural Responses to Risk and Uncertainty*, pp. 1-7. Cambridge: Cambridge University.

Rosen, A. M. 1995. The social response to environmental change in Early Bronze Age Canaan. *Journal of Anthropological Archaeology* **14**: 26-44.

Weiss, H., M.-A. Courty, et al. 1993. The genesis and collapse of third millennium North Mesopotamian civilization. *Science* **261**: 995-1004.

Wilkinson T.J. 1994. The Structure and Dynamics of Dry-Farming States in Upper Mesopotamia. *Current Anthropology* 35: 483-520.

Lecture 6

Key Texts

Dugmore, A., C. Keller, and T. H. McGovern. 2007. Norse Greenland Settlement: Reflections on Climate Change, Trade, and the Contrasting Fates of Human Settlements in the North Atlantic Islands. *Arctic Anthropology* 44:12-36.

Hegmon, M., Peebles, M., A., Kinzig, A. P., Kulow, S., Meegan, C. & Nelson, M. C. 2008. Social Transformation And Its Human Costs In The Prehispanic U.S. Southwest. *American Anthropologist*, 110, 313-324.

McGovern T.H. 1994. Management for Extinction in Norse Greenland. In C. Crumley, ed., *Historical Ecology*, pp. 127-154. Santa Fe: School of American Research.

Nelson, M. C., K. Kintigh, D. R. Abbot, and J. M. Anderies. Received from Author: October 2009. Archaeology's long-term perspective on irrigation infrastructure and vulnerability. Unpublished Proof.

Ogilvie, A. E. J., and T. Jönsson. 2001. 'Little Ice Age' Research: A Perspective from Iceland. *Climatic Change* 48:9-52.

Additional Reading

Billman, B. R., P. M. Lambert, B. L. Leonard 2000. Cannibalism, warfare, and drought in the Mesa Verde region during the twelfth century, *American Antiquity* 65(1): 145-178

Dugmore, A., A. F. Casely, C. Keller, and T. H. McGovern. Received from Author: October 2009. Conceptual modelling of seafaring, climate and the early European exploration and settlement of the North Atlantic Islands: Unpublished Draft.

Hevly, R. H. 1988. Prehistoric vegetation and paleoclimates on the Colorado Plateaus, in *The Anasazi in a Changing Environment* (G. J. Gumerman ed.). Cambridge: Cambridge University Press. Pp. 92-118

Larson, D. O. and J. Michaelson 1990. Impacts of climatic variability and population growth on Virgin Branch Anasazi cultural developments, *American Antiquity* 55(2): 227-249

Schlanger, S. H. 1988. Patterns of population movement and long-term population growth in Southwestern Colorado, *American Antiquity* 53(4): 773-793

Lecture 7

Key Texts

Lamb, H. H. 1982. *Climate, History and the Modern World*. New York, Methuen.

McCloskey, T. A., and G. Keller. 2009. 5000 year sedimentary record of hurricane strikes on the central coast of Belize. *Quaternary International* 195:53-68.

Ochatoma Paravicino, J. WARI, Capital Del Primer Imperio en los Andes Peruanos. Unpublished Leaflet.

Additional Reading

Dean, J. S. 2000. Complexity Theory and Sociocultural Change in the American Southwest, in *The Way the Wind Blows. Climate, History and Human Action* (R.J. McIntosh, J. A. Tainter and S. K. McIntosh eds.)

Fagan, Brian. 1999. *Floods, Famines and Emperors. El Nino and the Fate of Civilizations*. New York: Basic Books.

Melville, E. G. K. 1997. *A plague of sheep : environmental consequences of the conquest of Mexico*, 1st paperback edition. Studies in environment and history. Cambridge: Cambridge University Press.

Lecture 8

Key Text

Lamb, H. H. 1982. *Climate, History and the Modern World*. New York, Methuen. (CHAPTER 11 & 12)

Mrozowski, S. A. 2006. "Environments of History: Biological Dimensions of Historical Archaeology," in *Historical Archaeology*. Edited by M. Hall and S. W. Silliman, pp. 23-41. Oxford: Blackwell Publishing.

Additional Reading

Fagan, B.M. 2000. *Floods, Famines and Emperors : El Niño and the Fate of Civilizations*. London: Pimlico. Pp. 181-201, The Little Ice Age.

Fagan, B. 2000. *The Little Ice Age: How Climate Made History 1300-1850*. New York Basic Books.

McIntosh R.J., Tainter J.A., and McIntosh S.K. 2000. Climate, history, and human action. In R.J. McIntosh, J.A. Tainter and S.K. McIntosh, eds., *The Way the Wind Blows: Climate, History, and Human Action*, pp. 1-42. New York: Columbia University Press.