Plants and Archaeology
ARCL2009: 0.5 unit

Class Meetings
Tuesdays 11 AM- 1PM
Room B13
COURSE INFORMATION
This handbook contains the basic information about the content and administration of the course. Additional subject-specific reading lists and individual session hand-outs will be given out at appropriate points in the course. If students have queries about the objectives, structure, content, assessment or organisation of the course, they should consult the Course Co-ordinators.

Aim
This course aims to introduce students to the range of issues addressed through archaeobotanical data and the basic methods used in archaeobotany

Objectives
On successful completion of this course students should:
- Be able to recognise the different archaeobotanical datasets and explain how they are preserved.
- Have an overview of the questions addressed through archaeobotany.
- Be familiar with examples of studies of hunter-gatherer archaeobotany.
- Be able to describe the basic differences between a wild and domesticated cereal.
- Be able to discuss lines of evidence for the construction of past diet and food processing.
- Be able to discuss the reconstruction of past environments from archaeobotanical evidence.

Teaching Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 January</td>
<td>1</td>
<td>Introduction. -DF&lt;br&gt;What is archaeobotany? What are the big issues? What does archaeobotanical data look like and how is it used?</td>
</tr>
<tr>
<td>20 January</td>
<td>2</td>
<td>A practical introduction to cereals: identification, plant parts and processing, domestication criteria and processes. Starting your own project: Archaeobotanical samples, procedures, and sorting. - LL</td>
</tr>
<tr>
<td>27 January</td>
<td>3</td>
<td>Hunter-Gatherer diet and plant use.- LL</td>
</tr>
<tr>
<td>3 February</td>
<td>4</td>
<td>Documenting early cultivation and crop domestication.- LL</td>
</tr>
<tr>
<td>10 February</td>
<td>5</td>
<td>Reconstructing Agricultural Systems. Arable Ecology and Weed Seeds--Chris Stevens</td>
</tr>
<tr>
<td>17 February</td>
<td>6</td>
<td>READING WEEK. No Class Meeting</td>
</tr>
<tr>
<td>24 February</td>
<td>7</td>
<td>Crop-processing, archaeobotanical formation processes, and social inferences --DF</td>
</tr>
<tr>
<td>27 Feb.</td>
<td>8</td>
<td>Essay Due</td>
</tr>
<tr>
<td>3 March</td>
<td>9</td>
<td>Quantification and interpretation in archaeobotany, with special reference to the Lab Project. --LL</td>
</tr>
<tr>
<td>10 March</td>
<td>10</td>
<td>Reconstructing environments: data from wood charcoal, pollen, phytoliths --DF/LL</td>
</tr>
<tr>
<td>17 March</td>
<td>11</td>
<td>Direct indicators of Diet: From Palaeofoaece to Isotopes --DF</td>
</tr>
<tr>
<td>24 March</td>
<td>12</td>
<td>Course Integration and Review: From Human Ecology to Culinary Archaeology --DF</td>
</tr>
<tr>
<td>26 March</td>
<td>13</td>
<td>Lab Project Report Due</td>
</tr>
</tbody>
</table>
Teaching Methods & Laboratory Work
Course meetings will consist of 2-hour sessions, including a mixture of lecture, discussion and practical sessions. Students will be expected to carry out a lab project, involving microscopy. Microscopes and reference collections in Room 313 will be available for student use during normal weekdays 9-5, except when other classes are in session there (normally, 4-6pm Thursdays). The course instructor will be available outside of scheduled class periods, by arrangement, to provide additional practical supervision to students on an individual or small group basis, either in the lab (313) or the course instructor’s office (311). As indicated on the front page of this handbook, Friday or Tuesday afternoon are preferred time for lab work. At these times Dorian may be in the Lab and not his office.

WORKLOAD
There will be 20 hours of class time, including practical and discussion sessions, for this course. Students will be expected to undertake around 60 hours of reading for the course, plus 60 hours preparing for and producing the assessed work (including 20-30 hours of microscopy for the practical project). This adds up to a total workload of some 140 hours for the course.

Means of Assessment
One assessed essay (70%) and one assessed report (30%). Essay due 27 February; Practical Project report due 26 March.

Essay topics
Please select one of the following essay topics. This essay should be about 3500 words, i.e. 3,325-3,675 words. If it falls outside this length range it will be penalized in line with UCL policy.

1) How can archaeobotanical investigation of hunter-gatherer sites contribute to our understanding of ancient hunter-gatherer subsistence and scheduling?

2) What archaeobotanical criteria can be used to detect the beginnings of agriculture? Discuss these and how they have been applied or ought to be applied in a region of the world of your choice (e.g. Southwest Asia, China, Mesoamerica, North America).

3) How can archaeobotanical evidence be used to reconstruct aspects of agricultural practice (tillage, manuring, irrigation, storage), and what contribution does this make to our understanding of prehistoric societies?

4) How do archaeobotanical approaches based on preserved plant remains compare to the use of stable isotopes to reconstruct past diet?

Practical Project
The second assignment, a laboratory report of ca. 1500 words (1,425-1,575 words) based on a practical project. This word count does not include data tables or figures. Students will be given each 6 sub-samples of archaeobotanical flotation samples. With guidance provided in class, and supervision outside of class, students will be expected to sort their samples, separating seed/grain/chaff fragments from the background of wood charcoal fragments, and with assistance of Dr. Fuller identify plant remains recovered. Students will be expected to describe and quantify their results and suggest how these might be interpreted in terms of agriculture, wild plant use and/or crop-processing. The lab report should include the following general headings: introduction (introducing the site, and potential research questions to which the archaeobotanical evidence contributes), materials and methods (briefing describing the labwork and describing methods of counting & quantifying, with a few relevant references), results (presenting results and patterns in results, graphs and tables are useful here), discussion (a brief assessment of any potential conclusions).
In 2014, students will be offered samples from Ethiopia.

**CRITERIA FOR ASSESSMENT**
The criteria for assessment used in this course are those agreed by the Board of Examiners in Archaeology, and are included in the Undergraduate Handbook (available on the Institute web-site: [http://www.ucl.ac.uk/archaeology/administration/students](http://www.ucl.ac.uk/archaeology/administration/students)). In brief, the grades used are A, B, C, D, E and F, with finer distinctions indicated by a plus (+) or a minus (-). All coursework is marked by two internal examiners and can be re-assessed by the Visiting Examiner. Therefore, the mark given by the initial examiner (prior to return) is a provisional assessment for guidance only, and may be modified after consultation with the second internal examiner, or by the Visiting Examiner.

Specific criteria for marking differ between Year 2 and Year 3 students, Affiliate Students and qualifying year Post-Graduate in line with departmental policies.

**CITING OF SOURCES**
Coursework should be expressed in a student’s own words giving the exact source of any ideas, information, and diagrams etc. that are taken from the work of others. Any direct quotations from the work of others must be indicated as such by being placed between inverted commas. Plagiarism is regarded as a very serious irregularity which can carry very heavy penalties. It is your responsibility to read and abide by the requirements for presentation, referencing and avoidance of plagiarism to be found in the IoA ‘Coursework Guidelines’ at [http://www.ucl.ac.uk/archaeology/administration/students](http://www.ucl.ac.uk/archaeology/administration/students).

**SUBMISSION OF COURSEWORK**
The coursework must be stapled to a completed coversheet (available from outside Room 411A or at Reception) and submitted to the course co-ordinator’s pigeon hole via the Red Essay Box at Reception by the appropriate deadline. Late submission will be penalized unless permission has been granted and an Extension Request Form (ERF) completed. Please see the IoA ‘Coursework Guidelines’ for full details [http://www.ucl.ac.uk/archaeology/administration/students](http://www.ucl.ac.uk/archaeology/administration/students).

**SUBMISSION OF COURSEWORK TO ‘TURNITIN’**
In addition to submitting your coursework as described above, it is now a requirement that you submit it electronically to the Turnitin system. You will be provided with the necessary code for submitting your work for this course. Students who fail to submit their coursework to Turnitin will not receive the mark for the work in question until they have done so (although they will receive written feedback in the usual way). The maximum mark for work that has not been submitted to Turnitin prior to the meeting of the Board of Examiners will be a bare pass. In advance of submitting your coursework for marking you may, if you wish, run your work through the system in order to obtain a report on the originality of the wording and then make any necessary adjustments prior to final submission. Turnitin advisors will be available to help you at specified times if you need help generating or interpreting the reports. It is important to recognise that the final decision about whether work contains plagiarism rests with academic staff. Consequently, the presence or absence of matches in a Turnitin report does not, by itself, provide a guarantee that the work in question either contains or is free from plagiarism. Detailed instructions on the use of the system will be supplied separately.

Turnitin ID: 434714  
Password: IoA1213

**KEEPING COPIES**
Please note that it is an Institute requirement that you retain a copy (this can be electronic) of all coursework submitted. When your marked essay is returned to you, you should return it to the marker within two weeks.
COMMUNICATION
If any changes need to be made to the course arrangements, these will normally be communicated by email. It is therefore essential that you consult your UCL e-mail account regularly.

DYSLEXIA AND OTHER DISABILITIES
If you have dyslexia or any other disability, please make your lecturers aware of this. Please discuss with your lecturers whether there is any way in which they can help you. Students with dyslexia are reminded to indicate this on each piece of coursework.

FEEDBACK
In trying to make this course as effective as possible, we welcome feedback from students during the course of the year. All students are asked to give their views on the course in an anonymous questionnaire which will be circulated at one of the last sessions of the course. If students are concerned about any aspect of this course we hope they will feel able to talk to the Course Co-ordinator, but if they feel this is not appropriate, they should consult their Personal Tutor, the Academic Administrator (Judy Medrington), or the Chair of Teaching Committee (Dr. Karen Wright).

LIBRARIES
The library of the Institute of Archaeology will be the principal resource for assigned readings for this course. A number of reference books, useful for practical work, are available in the lab (313), and these can be consulted therein, but should not be removed from the laboratory.

ON-LINE SOURCES
The course coordinator maintains a number of web-pages with useful links and downloadable materials. This includes images on archaeobotanical field sampling, publications, which may be on the reading list or useful for essays, and practical handouts on identification (aimed at MSc students, but useful for the laboratory practical project).

From the top right side of Dorian staff profile there is a link to ‘archaeobotanical homepage’, which has resources and hand-outs useful to this course. Further down the page in links to resources from other archaeobotanical laboratories or related botanical sources: http://www.homepages.ucl.ac.uk/~tcrndfu/archaeobotany.htm

Most of Dorian’s publications can be downloaded from his staff profile; while others are organized thematically on this download page: http://www.homepages.ucl.ac.uk/~tcrndfu/downloads.htm

(These resources are due to be updated soon!)

Links to the above, can also be found in the ‘Flotation Gallery’: http://archaeobotany.googlepages.com/

Dorian’s blog: http://archaeobotanist.blogspot.co.uk/

See also recent notices of publications and web resources here: http://www.scoop.it/t/archaeobotany-and-domestication

Among other useful archaeobotanical site with available publications, visit


George Willcox’s website: http://g.willcox.pagesperso-orange.fr/
Naomi Miller’s website: http://www.sas.upenn.edu/~nmliller0/

Simone Riehls’ publications:
http://www.urgeschichte.uni-tuebingen.de/index.php?id=135&L=1
Or projects page: http://homepages.uni-tuebingen.de/simone.riehl/

Gary Crawford’s website: http://www.profgarycrawford.ca/

Elena Marinova: http://www.elenamarinova.net/index.html

http://paleobot.org/ (an attempt to create a facebook of archaeological seeds)
Course syllabus and reading

**Class 1: 13 January. Introduction**

**Lecture:** Overview of course organisation. Brief history of archaeobotany. Discussion of questions that can be addressed through archaeobotany. Modes of preservation of plant remains. General methods of sample collection.

**Introductory articles**


**Class 2. 20 January. A Practical introduction to cereals**

**Lecture:** This session will provide an overview of the staple cereals crops, their recoverable plant parts (chaff, grains) and domestication traits. It will involve some practical time. It will also provide an introduction to approaches to quantification in archaeobotany.

Also, in this session students will be given their own archaeobotanical samples, which will provide the dataset for their practical report, and will be given guidance on how to begin analysing them. *You will receive your lab report samples in this session.*

**Downloadable handout:** “A primer of cereals and grass inflorescence structure” [note: this is bilingual with Chinese]. Also recommended: Dorian’s millet atlas, and additional cereal identification guidance. http://www.homepages.ucl.ac.uk/~tcrrndfu/archaeobotany.htm

**Readings: on cereals**


**on quantification**


**Class 3. 27 Jan. Hunter-Gatherer diet and plant use**

This session will examine the role of plant foods and foraging in ‘pre-Neolithic’ economies, including ethnographic and ecological modelling, and several case studies. The session will provide a brief overview to the utility of anatomical study of charred parenchyma tissues in order to identify otherwise ‘invisible’ plants. Some reference will be made to other potential uses of gathered plants that probably date back to the Palaeolithic, including as ‘drugs’, ‘medicines’ and agents for birth control.
Downloadable handout: “The archaeobotany of hunter-gatherers”

Readings:
- Smith, Bruce 2011. General patterns of niche construction and the management of ‘wild’ plant and animal resources by small-scale pre-industrial societies. Philosophical Transactions of the Royal Society B 366: 836-848

Class 4, 3 Feb. Documenting early cultivation and crop domestication
In this session we will look at general principles involved in the study of agricultural origins, including defining domestication of plants and animals, cultivation and pastoralism, and review some of the kinds of archaeological and other evidence that can be used to investigate them. We will explore case studies from the Near East, China, India, Africa and only more briefly touch on the New World.

Origins of agriculture. Basic Readings:

OR

AND/OR

AND/OR
AND/OR

DEBATE: Was Domestication Fast or Slow? Once or Many?

OR

VS.

OR
- Tanno, K.-L., and Willcox, G. 2012. Distinguishing wild and domestic wheat and barley spikelets from early Holocene sites in the Near East. *Vegetation History and Archaeobotany* vol. 21(2) [March 2012]

Class 5. 10 Feb. Reconstructing Agricultural Systems
Contrasts between different types of agricultural systems: Vegeculture, Seed Crop Agriculture, Perennials and Aboriculture. Aspects of the evolution of agricultural systems, including irrigation, tillage, intensification and diversification, will be addressed.

Readings:
- Jones, G., Charles, M., Bogaard, A., Hodgson, J.G. and Palmer, C. 2005 The
functional ecology of present-day arable weed floras and its applicability for the identification of past crop husbandry. *Vegetation History and Archaeobotany* 14(4): 493-504

**Class 6. 24 Feb. Crop-Processing, archaeobotanical formation processes, and social inferences**

In this session we will explore the processes that contribute to the formation of the archaeobotanical record, contrasting water-logged macro-remains with charred macro-remains. The important insights of ethnographic models, especially of the processing cereal crops, will be highlighted, as will their potential to discuss social patterns. In addition, the preservation of biomolecular evidence, especially ancient DNA, will be briefly covered. A practical examination of charred archaeobotanical samples will be undertaken in order to observe and discuss the state of preservation, assemblage composition and the challenges of identification.

Downloadable handout: “Archaeobotany taphonomy and crop-processing: diagrams and selected bibliography” [revised bilingual version recommended]

**Readings:**

- Kreuz, A. and E. Shafer (2008) Archaeobotanical consideration of the development of Pre-Roman Iron Age crop growing in the region of Hesse, Germany, and the question of agricultural production and consumption at hillfort sites and open settlements. *Vegetation History and Archaeobotany* 17 (S1): S159-S179

**Class 7. 3 March. Reconstructing environments**

General overview of approaches to classifying and describing plant communities and their dynamics. Categories of macro-remains will be considered in terms of their utility for reconstructing past environments, especially wood charcoal and water-logged seeds and leaves. Micro-remains, especially pollen, will be introduced, with a discussion of reading pollen diagrams. The key theme will be identifying and distinguishing vegetational change from climatic forcing as opposed to human impact, especially through the spread of agriculture. Pollen may come from either natural deposits or cultural (archaeological) deposits, and the potential contribution of both will be discussed. Issues of taphonomy and the resolution of temporal and spatial scale will be considered.
Downloadable handouts: “Environmental reconstruction…..macros….micros”

Readings
- OR
[History of Pollen analysis] 311-348 [presenting and interpreting … ]
[if you cannot get ahold of the second edition, then read the first edition (1989), pp. 256-258, 84-302 [INST ARCH BB5 PEA; issue desk: IOA PEA 6]

Wood Charcoal:

Class 8. 10 March. Food Processing, nutrition and post-harvest intensification
The important role of processing plant foods and the reconstruction of processing patterns will also be discussed. Particular emphasis will be laid on the role of processing in making tubers edible. The concepts of bioaccessibility and bioavailability will be introduced.

Readings:
- Wollstonecroft, MM, PR Ellis, GC Hillman, DQ FULLER, and PJ Butterworth (2012). A calorie is not necessarily a calorie: technical choice, nutrient
bioaccessibility, and interspecies differences in plants. [Letter] PNAS vol. 109, no. 17: E991 [online]


And/or


[It is also recommended that you read the paper by Barry Kemp which precedes the Samuel paper and discusses the food on the same site from the perspective of ancient textual evidence] [download from www.ancientgrains.org]


**Class 9. 17 Mar. Direct Indicators of Diet: From PalaeoFaeces in Isotopes.**

This session will look at methods for assessing the actual composition of ancient diets, especially in terms of plant foods, and their effects on nutrition/ malnutrition. Topic cover will include the analysis of coprolites, gut contents, ceramic botanical residues, and stable isotopes from human bone.

**Readings:**

- White, Christine D. 1993. “Isotopic Determination of Seasonality in Diet and Death from Nubian Mummy Hair” in *Journal of Archaeological Science* 20: 657-666 [INST ARCH PERS; this article can be downloaded through the UCL network from http://www.idealibrary.com/]

**Class 10. 24 Mar. Course Integration and Review: From Human Ecology to Culinary Archaeology.**

This session will reconsider the subject of this course in the context of archaeological theory, both in terms of the general application of archaeobotany within archaeological research programs (Butzer, Hodder), as well as theoretical questions that archaeobotany can be used to address, including the evolutionary ecology of humans and human-influenced ecosystems. Be prepared to discuss an explicitly post-processual case study (Skoglund).

**Readings:**

- Butzer, K. 1982. *Archaeology as Human Ecology*. Cambridge: Cambridge University Press. **Chaps. 1, 13, 15** [INST ARCH AH BUT; and issue desk]


• Fraser, Evan D. G. and A. Rimas (2010) *Empires of Food. Feast, Famine and the rise and fall of Civilizations.* Free Press, New York. PP. 7-39, the next section also recommended (pp. 41-68).
FURTHER READINGS BY WEEK AND TOPIC:

1. 13 January: Introduction.

Further readings on some case studies to be introduced

- Willcox, George and Danielle Stordeur (2012) Large-scale cereal processing before domestication during the tenth millennium cal BC in northern Syria. Antiquity 86 (331): 99-114

Further introductory readings


2. 20 January. A Practical introduction to cereals.

On cereals, and their domestication


**on quantification**

- Chapters in *Integrating Zooarchaeology and Paleoethnobotany*. Edited by A. M. VanDerwarker and T. M. Peres. Springer, New York, 2010

**3. 27 Jan. Hunter-Gatherer diet and plant use.**


**Further Reading: NEAR EAST**


Further Reading: Europe and North America

Perry, David 1999. Vegetative tissues from mesolithic sites in the Northern Netherlands, Current Anthropology 40(2): 231-237. [ANTHROPOLOGY PERS; this article can be downloaded through the Ucl network from http:/uk.jstor.org/]


Wollstonecroft M. (2002) "The Fruit of their labour: plants and plant processing at EeRb 140 (860 ± 60 uncal to 160± 50 uncal B.P.) a late prehistoric hunter-gatherer-fisher site on the southern Interior Plateau, British Columbia, Canada". Vegetation History and Archaeobotany 11: 61-70.

Further readings on Jomon Japan


Bleed, P and Matsui, A. 2010. Why didn’t agriculture develop in Japan? A


4. 3 Feb. Documenting early cultivation and crop domestication

- Barker, G. 2006. The Agricultural Revolution in Prehistory. OUP

Further Readings (regional)

Island Southeast Asia & New Guinea


Further reading Southwest Asia (Near East)
• *Vegetation History and Archaeobotany* Volume 21, Issue 2, March 2012. Special Issue: From collecting to cultivation: transitions to a production economy in the Near East


**Further Readings: Central Asia**

• Harris, David R. 2010. *Origins of Agriculture in Western Central Asia: An Environmental-archaeological Study.* University of Pennsylvania Press

**Further Readings: South Asia**


• Kingwell-Banham, Eleanor and Dorian Q Fuller (2012) Shifting cultivators in South Asia: Expansion, marginalisation and specialisation over the Long-Term. Quaternary International 249: 84-95

Further readings: East Asia
• Fuller, Dorian Q, Ling Qin, Yunfei Zheng, Zhijun Zhao, Xugao Chen, Leo Aoi Hosoya, and Guo-ping Sun (2009) The Domestication Process and Domestication Rate in Rice: Spikelet bases from the Lower Yangtze. Science 323: 1607-1610
• Lu, Houyuan et al. (2009) Earliest domestication of common millet (Panicum miliaceum) in East Asia extended to 10,000 years ago. Proceedings of the National Academy of Sciences (USA) [PNAS] vol. 106 no. 18 7367-7372
Further readings: Africa


North America

- Cowan, C. W. 1997, Evolutionary changes associated with the domestication of Curcurbita pepo. Evidence from eastern Kentucky, in in People, Plants and Landscapes. Studies in Paleoethnobotany (K. J. Gremillion ed.). Tuscaloosa:
University of Alabama Press. Pp. 63-85 [[INST ARCH BB 5 GRE, 3 hr. res.]


**Mesoamerica**


- Smith, Bruce D. 2001. Documenting plant domestication: The consilience of biological and archaeological approaches, Proceedings of the National Academy of Science USA 98(4): 1324-1326 [Teaching Collection; this article can be downloaded through the UCL network from http://www.pnas.org/all.shtml]

Also see the articles on which Smith is commenting in the same journal issue:


- Benz, Bruce F. 2001. Archaeological evidence of teosinte domestication from Guila Naquitz, Oaxaca PNAS 98: 2104-2106 [SCIENCE PERS; this article can be downloaded through the UCL network from http://www.pnas.org/all.shtml]


South America


Further readings:
6. 24 Feb. **Crop-Processing, archaeobotanical formation processes, and social inferences.**

**Further reading on contamination:**

**Further reading on carbonization:**
- Braadbaart, Freek, 2008, Carbonisation and morphological changes in modern dehusked and husked Triticum dicoccum and Triticum aestivum grains, *Vegetation History and Archaeobotany* 17(1):155-166.

**Further readings on crop processing:**
- Reddy, Seetha N. 1997. If the threshing floor could talk: integration of agriculture and pastoralism during the Late Harappan in Gujarat, India, *Journal of Anthropological Archaeology* 16: 162-187 [INST ARCH PERS; also available on-line]

**Further readings on Dung burning**
- Miller, Naomi F. Seed eaters of the ancient Near East: Human or Herbivore?, *Current Anthropology* 37(3): 521-528
- Miller, N. F. 1997. Reply to Hillman et al., *Current Anthropology* 38(4): 655-659 [ANTHROPOLOGY PERS; these may be downloaded through the UCL network from
http://uk.jstor.org/]


7. 3 March. **Reconstructing environments.**

**Further Readings:**

8. 10 March. **Food Processing, nutrition and post-harvest intensification**

**Further Reading:**
- *Archaeological and Anthropological Sciences* vol. 3(1). Special Issue

**Recommended further reading on tubers**
- Hather. Jon. 2000. *Archaeological Parenchyma.* Archetype Press, London. Especially Chaps. 1, 2, 4, 5, 6, 7. This chapters are all quite short and heavily illustrated. [INST ARCH BB 51 QtO HAT ]

9. 17 Mar. **Direct Indicators of Diet: From Palaeofaeces in Isotopes.**

**Further reading:**


10. 24 Mar. Course Integration and Review: From Human Ecology to Culinary Archaeology

Further Reading


  - Rosen, A. 2007. *Civilizing Climate*. Alta Mira Pr