Potential changes in light of the COVID-19 pandemic

Please note that information in the handbook endeavours to be as accurate as possible. However, in light of the Coronavirus (COVID-19) pandemic, the changeable nature of the situation and the possibility of updates in government guidance, there may need to be changes during the course of the year. UCL will keep current students updated of any changes to teaching, learning and assessment on **https://www.ucl.ac.uk/students/**.

UCL Institute of Archaeology

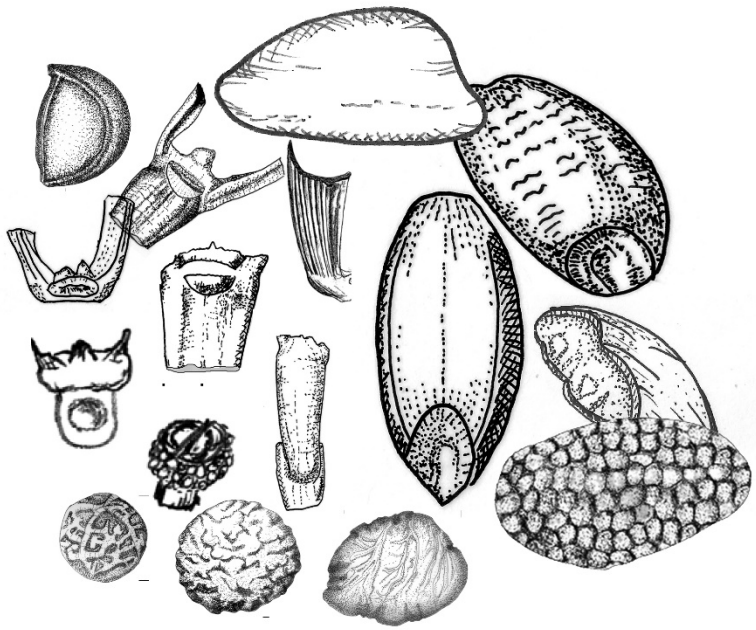
ARCL0096 Archaeobotanical Analysis in Practice

2022-2023, Term 2

MA/MSc module
15 credits

Co-ordinator: Dorian Q Fuller
Email: d.fuller@ucl.ac.uk

Room 311, phone 2 4771 [020-7679 4771], office hours: Wednesday: 11am-1pm, Friday, 2pm-3pm, or by appointment
Other contributing instructors: Dr. Susan Colledge
Teaching Assistant : Anna Den Hollander (anna.hollander.18@ucl.ac.uk)



Course sessions: IoA Room 313 (Archaeobotany & Palaeoecology Laboratory),
Dilvered as an intensive short course in Reading Week, Term 2:
13-17 Feb 2023. 9:30-5pm

1. MODULE OVERVIEW

The overall aim of this course is to prepare students on the practical hands-on aspects of sorting, and especially the identification of archaeobotanical macro-remains. Quantification and reporting will be discussed to some extent, but this course focuses on the botanical "nuts and bolts" of archaeobotanical seed research. Practical demonstration sessions are focused in most detail on major Old World seed crops (including Near Eastern/European as well as South/East Asian and African taxa) and systematic groupings (key families and orders, such as those that recur as arable weeds in the Old World). The intended outcome is that, through the study of specific laboratory specimens, students will obtain skills in seed identification, which are transferable, i.e. can also be applied to the identification of taxa not examined here. The course provides basic methodological tools for seed identification that can be applied to other taxa (and from other regions, e.g. New World species) as well as supervised sessions on sorting flotation samples, drawing, measuring and counting seeds and using the seed comparative collections. Although tubers will be introduced, this course does not provide training in the identification of parenchyma, nor of wood, phytoliths or pollen. Students with research needs in this non-seed areas, need to consult the instructor about additional tutoring and self study.

This short course is focused on seed identification, and while there will be some discussion of topics such as archaeobotanical research questions, quantification and field sampling, these are not covered in detail. (MSc students get further coverage of these topics in the Environmental Archaeology in Practice core course or the Resources & Subsistence core course).

Learning Outcomes

On successful completion of this course a student should:

- Comprehension of technical jargon relevant to carpology, the study of seed and fruit anatomy or morphology.
- Understanding of identification criteria used to separate wheat and barley species, oats and rye, Old World millets, Old world pulses, common oilseed and fibre crops
- Understanding of how charred archaeobotanical material differs from modern reference material
- A working knowledge of the range of potential edible fruit and nut taxa that might be recovered archaeological
- Understanding of how seed form and internal anatomy can aid taxonomic assignment, and an appreciation how the study of reference material from related taxa can provide a firm basis for archaeobotanical identification
- An appreciation of how crop-processing may structure archaeobotanical assemblages

Enhanced skills in:

- Critical analysis of archaeobotanical identifications
- Understanding of technical archaeobotany publications;
- Written analysis and presentation of ideas, including through technical diagrams.
- The use of taxonomic reference collections

Methods of Assessment

In this course, students are marked on one written and illustrated assignment; and they take a two-hour practical examination in seed identification (to be scheduled in Term 3). The expectation is that this exam will take place in the laboratory with actual specimens. If circumstances make that impossible an exam based on photographs will be an alternative.

Communications

- **Moodle** provides information for this course, including PDFs of essential hand-outs and unpublished reading material, as well as additional useful sources.
- Important information will be posted by staff in the **Announcements section of the Moodle page** and you will automatically receive an email notification for these.
- Please post any general queries relating to module content, assessments and administration **in** in Moodle Q&A or via email if you prefer. This forum will be checked regularly.
- For personal queries, please contact the co-ordinator by email.

Please refer to the IoA Student Handbook and IoA Study Skills Guide:
https://www.ucl.ac.uk/archaeology/current-students/ioa-student-handbook
https://www.ucl.ac.uk/archaeology/current-students/ioa-study-skills-guide
for instructions on coursework submission, IoA referencing guidelines and marking criteria, as well as UCL policies on penalties for late submission.

DAY by DAY summary. **Most days will be divided into 4 sub-sections**

DAY	Date	Topic	Lecturers
1	13 Feb	**1A.** Fruits, Seeds and seed-alikes: defining basic categories **1B.** Turning flowers into fruits: Examples of the Solanaceae, Rosaceae **LUNCH** **1C.** A brief introduction to taxonomic nomenclature phylogenetic systems, and the evolution of seeds. **1D.** Cereal Identification Part 1: grasses & cereals (Poaceae), an overview- barley, wheat, rice, a few millets	DQF
2	14 Feb	**2A.** Practice Quiz **2B**. Cereal Identification Part 2: wheat, rye, oats and related grasses **LUNCH** **2C**. Pulses and an introduction to legume seeds **2D.** A first look at weed seeds: comparing Cyperaceae and Polygonaceae Nutlets. A first consideration of pseudo-cereals.	DQF
3	15 Feb. AM	**3. An introduction to sorting samples. 3A.** Practical sorting: cereals, chaff and weeds **3B.** crop-processing. A brief discussion	DQF
3	15 Feb PM	**3C.** Cereal identification Part 3. Wheat glumes bases and rachis segments; observing cereal chaff, measuring cereal grains	SC
4	16 Feb	**4A**. An overview of nuts, and selected fruits. **4B**. Cucurbits **4C.** Oilseeds, Fibre crops- esp. Asteraceae, Brassicaceae, Malvaceae, Lamiaceae, Linaceae, Pedaliaceae **4D.** Cereal identification Part 4. Millets, and over view of wild grasses.	DQF
5	17 Feb	**5A.** Gymnosperms and Basal Angiosperms **5B**. An introduction to monocots **5C.** Higher Eudicot trends: towards curled embryos and trigonous seeds- Solanalese vs. Caryophyllales **5D**. Foramtive review quiz	DQF

Lecturers

DQF= Dorian Q Fuller, SC= Dr. Susan Colledge

Module Plan

The module is taught in the lab, with some lecturing and demonstration but mostly through observation by students through the microscope of specimens (modern reference material

and archaeological specimens), accompanied by making labelled sketches and consulting diagrams in provided teaching materials. **Please bring paper, and expect to make sketches; it is recommended that you have a larger ring binder to keep your sketches and provided hand-outs in.** During practical sessions tutoring will be provided as needed. Expect to spend additional time outside of class in the lab examining and re-examining materials, which is essential for preparing for the practical exam, as for the written assignment.

Some sessions will begin include a practical quiz (numbers specimens to identify), which serves to reinforce material learned in previous weeks and to introduce new materials that challenges the students. These are not marked and going through the answers together providing a key learning opportunity to discuss archaeobotanical identification processes. These also serve as practice for the kind of material and format of the practical exam

STANDARD OF LABORATORY PRACTICE FOR Using the Institute of Archaeology Archaeobotany Laboratory: It is expected that all participants will practice good standard laboratory practice. All reference material MUST be returned to its correction location in the collections so that others may consult it. Bench areas must be left clean: i.e. microscopes should be covered when not in use, glassware and other supplies should be washed and/or put away, the bench area wiped of any debris.

WORKLOAD

Students are expected to invest additional time in the laboratory, subsequent to the course, to study and draw specimens from the comparative collection, as well as for their essay assignment. You should expect to spend ~4 hours per week over ten weeks on individual study in laboratory. This can be spread over Term II and part of Term III up to the time of the practical exam. The final assessments-- an essay, and exam, will be scheduled for Term III.

STUDENT WORKLOAD DISTRIBUTION ~ 150 HRS

Nature Of The Work	Hours
Seminars/ Practical classes / tutorials	**20**
Private reading	**40**
Practical study time in lab	**40**
Required written work (e.g. essay/report)	**50**

2. ASSESSMENT

(1) PRACTICAL EXAM ON KEY ECONOMIC SPECIES (50%)

TO BE SCHEDULED FOR TERM III.: Students are asked to identify (to Family/genus and/or species) specimens of key economic species and required to give the type of plant fruit (e.g. achene, nut, caryopsis, drupe) and in some cases addition information such as region of domestication. The exam is in two parts: for Part 1, students may use their labnotebooks, handouts, etc. to help them with their identifications; and for Part 2 no hand-outs or notebook may be used. All items will be worth 2 or 3 points with partial credit awarded for incomplete identification (e.g. for higher taxonomic level identification, plant part identification). Practice quizzes during the course are of similar format and will provide practice. Study specimens will be available for study in the

student's own time, up to the day before the exam. A study of list taxa that might be on the exam will be provided via Moodle. Specimens for exam may be archaeological.

(2) WRITTEN ASSIGNMENT: 2,500 WORDS PLUS ILLUSTRATIONS. 50%. Due: 2 May 2022

This assignment entails both laboratory and literature research. Students are expected to undertake a small comparative study of plants in a given taxonomic order (sensu Simpson 2019) of seeds, or groups of domesticates, and to prepare drawings,

measurements and descriptions. Potential topics and taxa groupings are outlined below; it is expected that students in a particular academic session will do different topics from each other.

The aims of the assignment are to generate guidelines for the identification of specimens found in archaeological contexts, and to observe how species morphological features relate to evolutionary relationships such as phylogeny or domestications. The study should include a bare minimum of 15 taxa, such as five species representing each of 3 related families. (Nevertheless, the study of more than 15 taxa does not guarantee a higher mark; rather, this assignment calls for a comprehensive analysis of a minimum of 15 taxa.) Students should focus on identifiable morphological features of the relevant seeds/plant parts under study, bearing in mind that these features might be altered by charring and other taphonomic factors; comparisons should also consider the human use implications of the recovery of each taxon in archaeological assemblages (uses as food, medicine, and/or raw materials for making tools, clothing, shelter, etc.), as well as botanical and environmental implications i.e. time of year flowering/fruiting and the biogeographic (or other environmental) zones it represents.

The written report should be approximately 2,500 words, including relevant background information, and suitably illustrated with drawings and/or photographs and charts and/or tables. All drawings, charts, tables and photographs should be properly captioned/titled. (Drawings, photographs and charts are captioned as "Figures" and placed below the image; "Table" captions are placed above the table.) Figure and Table numbers should follow sequentially and be indicated in the essay body. Drawings and photographs should include scale bars and appropriate labelling of plant/seed parts. When used properly, charts and tables are excellent tools for summarising data, particularly for comparisons, and because they are not included in the word count, can help keep within the word count.

The intended learning outcomes of this assignment are enhanced awareness and improved skills in the observation and documentation of information that is necessary for archaeobotanical identification and interpretation. Comparisons of related species help students to refine their identification skills and understand evolutionary relationships.

* Note: it is recommended that students begin working on the written assignment during Term II. You are responsible for your own time management.

PRATICAL ESSAY TOPICS A topic sign-up sheet will be posted during the short course, Reading week Term II.

1. Identification criteria, and comparative anatomy for seeds of the Brassicales, including Capparaceae, Cleomaceae, and Brassicaceae. Include some edible species and some weeds.

2. Identification criteria, and comparative anatomy for seeds of the Lamiales, such as the families Lamiaceae, Plantaginaceae, and Schrophulariaceae. Include at least 6 economic (crop species) and some agricultural weeds.

3. Identification criteria, and comparative anatomy for seeds of the Apiaceae—looking at at least 5 tribes across this family, including some crop species

4. Identification criteria, and comparative anatomy for seeds of the Asteraceae—looking at at least 5 tribes across this family, including some crop species

5. Identification criteria, and comparative anatomy for seeds of the Urticalean Rosales, including the families Urticaceae, Ulmaceae, Rosaceae and Cannabaceae

6. Identification criteria, and comparative anatomy for seeds of the Malvales, including the traditional families of Malvaceae, Bombaceae and Tiliaceae.

7. Identification criteria, and comparative anatomy for seeds of the Sapindales, including at least the 4 following families, Rutaceae, Meliaceae, Sapindaceae, Anancardiaceae

8. Identification criteria, and comparative anatomy for nutlets of the Cyperaceae, including at least 5 tribes

9. Identification criteria, and comparative morphology and domestication traits in Chloridoid grasses, including Eragrostidae at least 4 other tribes.

10. Identification criteria, and comparative morphology and domestication traits in Panicoid grasses, including Paniceae and Andropogonae tribes, some crops and non-crops.

11. Identification criteria, comparative morphology of grains and chaff in the Aveneae, Stipeae and a related tribe of grasses.

12. Identification criteria of the seeds and fruits of the Asian spice trade.

Other topics may be possible. If you have an idea for another topic, along these lines, please discuss it with Dorian.

3A. TEXTBOOK. The main texts will consist of draft chapters of *Seeds for the Archaeologist.* These will be provided as hardcopy and available to download for reading ahead of time, via moodle. Readings for Day 1-2 will be emailed ahead of time.

3B. GENERAL TEXTS AND BACKGROUND READING

This short course is focused on seed identification, and while there will be some discussion of topics such as archaeobotanical research questions, quantification and field sampling, these are not covered in detail. (MSc students get further coverage of these topics in the Environmental Archaeology in Practice core course or the Resources & Subsistence core course). It is highly recommended that you do some preparatory background readings on three aspects of archaeobotany before coming the course. Some suggested readings, on the following subjects, are listed below:

a. the aims and practices of archaeobotany in general;

b. quantification in archaeobotany [introduced in *Environmental Archaeology in Practive*];

c. wild progenitors, crop origins and crop domestication [introduced in *Resources and Subsistence*].

Below are some introductory sources related to the above topics.

A). General Archaeobotany & Aims

Readings presented in this section provide introductions to archaeobotanical analysis and the overall aims of archaeobotany that are particularly helpful for those less familiar with this topic. □ For the history of flotation, see: //sites.google.com/site/archaeobotany/

Cappers, Rene and Reinder Neef. 2012. *Handbook of Plant Palaeoecology.* Groningen, Netherlands : Barkhuis, University of Groningen Library. *Note:* the second edition of Cappers and Neef (2021) is expanded and improved, but is not available online. The earlier addition is Online: https://www-jstor-org.libproxy.ucl.ac.uk/stable/j.ctt20p56g8

Champion, L. and Fuller, D. Q. (2019) Archaeobotany: Methods and Themes. In Mitchell, Peter (ed.) *The Oxford Encyclopedia of African Histories: Methods, Sources, and Historiographies.* Oxford: Oxford University Press. Online publication 30 Dec 2018: DOI: 10.1093/acrefore/9780190277734.013.204

Fuller, D.Q. 2008. Archaeological Science in Field Training. in Ucko, P., Qin ,L., Hubert,J. (ed.) From Concepts of the Past to Practical Strategies: The Teaching of Archaeological Field Techniques. London: Saffron Press, 183-205 *Provides a short history of archaeobotany and sampling.*

Fuller, D. Q. and Leilani Lucas (2014) Archaeobotany. In *Encyclopedia of Global Archaeology* (Claire Smith, Ed.). Springer, New York. pp 305-310

Fuller, Dorian Q, Chris Stevens and Meriel McClatchie (2014). Routine activities, tertiary refuse, and Labor organization. Social inferences from everyday archaeobotany. In *Ancient Plants and People. Contemporary Trends in Archaeobotany*, edited by Marco Madella, Carla Lancelotti and Manon Savard. Tucson: University of Arizona Press. Pp. 174-217

Fritz, G.J. 2005. Paleoethnobotanical Methods and Applications. In Handbook of Archaeological Methods, Manschner, D.G. and Chippindale, C. (Eds), pp.771-832. Walnut Creek California. Altimira Press. *An excellent, up-to-date summary of archaobotany field recovery techniques, laboratory sorting, analysis and quantification methods.*

Greig, J. 1989. Archaeobotany. Strasbourg: European Science Foundation. 93pp. INST ARCH BB 5 GRE

Marston, J.M., Guedes, J.D.A. and Warinner, C. eds., 2015. *Method and theory in paleoethnobotany*. University Press of Colorado. [INST ARCH BB 5 MAR]
Online: https://muse-jhu-edu.libproxy.ucl.ac.uk/book/38157

Miksicek, C. H. 1987. Formation Processes of the Archaeobotanical Record. *Advances in Archaeological Method and Theory* 10, pp. 211-247 *Although somewhat dated, provides useful overviews of the types of environments within which plant remains best survive as well as the types of plant parts that best survive.*

Pearsall, D. 2000. Paleoethnobotany. A Handbook of Procedures, Second Edition. New York: Academic Press. [also 1st edition, 1989] INST ARCH BB5 PEA; *In particular, read the Chapter on Macro-remains. The Second Chapter on sampling and flotation is useful for preparing for fieldwork. However, this book is not useful for the sorting, identification and basic analysis of macro-remains assemblages*

Wilkinson, K. and Stevens, C. 2003. *Environmental Archaeology.* Approaches, Techniques & Applications. Tempus, Stroud. *In particular, read the Chapter on Subsistence*

Wood charcoal, parenchyma tissue and phytoliths are not treated in this course; readings on these subjects are listed in APPENDIX A (below).

B. Quantification in Archaeobotany (including sampling issues)

Chiou, K.L., Cook, A.G. and Hastorf, C.A., 2013. Flotation versus dry sieving archaeobotanical remains: A case history from the Middle Horizon southern coast of Peru. *Journal of field archaeology*, *38*(1), pp.38-53.

Green, W.A., 2009. Hatching seeds before they're counted. *Archaeological and Anthropological Sciences*, *1*(1), pp.1-13.

Hastorf, C. and Popper, V. (eds.) 1988. Current Paleoethnobotany Chicago: University of Chicago Press [INST ARCH BB 5 HAS, with 1 copy at issue desk] *This includes several case studies in quantification*

Kidder, T.R., 1997. Sugar reflotation: An alternative method for sorting flotation-derived heavy fraction samples. *Journal of Field Archaeology*, 24(1), pp.39-45.

Lee, G.A., 2012. Taphonomy and sample size estimation in paleoethnobotany. *Journal of Archaeological Science*, 39(3), pp.648-655.

Lepofsky, D. and Lertzman, K., 2005. More on sampling for richness and diversity in archaeobiological assemblages. Journal of Ethnobiology, 25(2), pp.175-188.

Madella, M., C. Lancelotti and M. Savard (eds) 2014. *Ancient Plants and People. Contemporary Trends in Archaeobotany.* University of Arizona Press. ONLINE: https://www-jstor-org.libproxy.ucl.ac.uk/stable/j.ctt1814hr4

Marston, J.M., Guedes, J.D.A. and Warinner, C. eds., 2015. *Method and theory in paleoethnobotany*. University Press of Colorado. [INST ARCH BB 5 MAR] Online: https://muse-jhu-edu.libproxy.ucl.ac.uk/book/38157

Tolar, T., Jacomet, S., Velušček, A. and Čufar, K., 2010. Recovery techniques for waterlogged archaeological sediments: a comparison of different treatment methods for samples from Neolithic lake shore settlements. *Vegetation History and Archaeobotany*, 19(1), pp.53-67.

Van der Veen, M. 1992. Crop Husbandry Regimes. Sheffield Archaeological Monographs. *See in particular discussion on crop-processing, producer-consumer models, and introduction of multivariate analysis approaches*

Van der Veen, M. and Fieller, N., 1982. Sampling seeds. *Journal of Archaeological Science,* 9(3), pp.287-298.

Van Der Werker, A. M. and Peres, T. M. (eds.) 2010. *Integrating Zooarchaeology and Paleoethnobotany: A consideration of Issues, Methods and Cases*. Springer, Heidelberg [INST ARCH BB 3 VAN], also ONLINE: https://link-springer-com.libproxy.ucl.ac.uk/book/10.1007%2F978-1-4419-0935-0

Vandorpe, P. and Jacomet, S., 2007. Comparing different pre-treatment methods for strongly compacted organic sediments prior to wet-sieving: a case study on Roman waterlogged deposits. *Environmental archaeology*, 12(2), pp.207-214.

Wright, P.J., 2005. Flotation samples and some paleoethnobotanical implications. *Journal of Archaeological Science*, 32(1), pp.19-26.

The two papers below present systems for observing, ***recording and quantifying preservation condition*** *of cereals and other seeds in order to establish more accurate seed counts and/or seed MNIs.*

Antolin, F. and Buxo R. 2011. Proposal for the systematic description and taphonomic study of carbonized cereal grain assemblages: a case study of an early Neolithic funerary context in the cave of Can Sadurnı´ (Begues, Barcelona province, Spain) *Veget Hist Archaeobot* 20:53–66

Hubbard, R. and al Azm, A. 1990. Quantifying Preservation and Distortion in Carbonized Seeds; and Investigating the History of Frike Production. *J. Archaeological Science* 17: 103-106

The papers below introduce ***charring experiments*** *that deal with differential preservation and size changes due to preservation by charring*

Berihuete-Azorín, M., Stika, H.P., Bourliva, A., Papadopoulou, L. and Valamoti, S.M., 2019. "Fresh from the Oven": experiments on *Triticum spelta* and a protocol for carbonising specimens for archaeobotanical comparison collections. *Journal of Archaeological Science: Reports*, 26, p.101865.

Bishop, R.R., 2019. Experiments on the effects of charring on hazelnuts and their representation in the archaeological record. *Journal of Archaeological Science: Reports*, 26, p.101839.

Boardman, S. and Jones, G., 1990. Experiments on the effects of charring on cereal plant components. *Journal of archaeological science,* 17(1), pp.1-11.

Castillo, C.C., 2019. Preservation bias: is rice overrepresented in the archaeological record?. *Archaeological and Anthropological Sciences*, 11(12), pp.6451-6471.

Charles, M., Forster, E., Wallace, M. and Jones, G., 2015. "Nor ever lightning char thy grain" 1: establishing archaeologically relevant charring conditions and their effect on glume wheat grain morphology. *STAR: Science & Technology of Archaeological Research*, 1(1), pp.1-6.

Gustafsson, S. 2000. Carbonized Cereal Grains and Weed Seeds in Prehistoric Houses—an Experimental Perspective. *J. Archaeological Science* 27, 65–70

Märkle, T. and Rösch, M., 2008. Experiments on the effects of carbonization on some cultivated plant seeds. *Vegetation History and Archaeobotany*, *17*(1), pp.257-263.

Margaritis, E. and Jones, M., 2006. Beyond cereals: crop processing and Vitis vinifera L. Ethnography, experiment and charred grape remains from Hellenistic Greece. *Journal of Archaeological Science,* 33(6), pp.784-805.

Sievers, C. and Wadley, L., 2008. Going underground: experimental carbonization of fruiting structures under hearths. J*ournal of Archaeological Science*, 35(11), pp.2909-2917.

Walsh, R., 2017. Experiments on the effects of charring on *Setaria italica* (foxtail millet). *Vegetation History and Archaeobotany*, 26(4), pp.447-453.

White, C., Toro, F. and White, J., 2019. Rice carbonization and the archaeobotanical record: experimental results from the Ban Chiang ethnobotanical collection, Thailand. *Archaeological and Anthropological Sciences,* 11(12), pp.6501-6513.

Wright, P., 2003. Preservation or destruction of plant remains by carbonization?. *Journal of Archaeological Science*, 30(5), pp.577-583.

C. Wild progenitors and crop origins

The following readings consider how an understanding of botany contributes to identifying where cultivation took place, and the mapping and ecology of wild progenitors and how these differ from their domesticated progeny. These sources also consider the domestication process and traits.

Fuller, D. Q. 2002. Fifty Years of Archaeobotanical Studies in India: Laying a Solid Foundation. In Settar, S., Korisettar, R. (Eds.). *Indian Archaeology in Retrospect, Volume III. Archaeology and Interactive Disciplines* (pp.247-364). New Delhi: Manohar. *This summarizes what the main cereals and pulses of India, including native wild progenitors, as well as a history of research in India. This information has been updated/ superseded by subsequent Fuller publications, for a most recent see Fuller and Murphy 2018 (below)*

Fuller, Dorian (2015) Wild Progenitors. In: Metheney, Karen Bescherer; Beaudry, Mary C. (eds) *Archaeology of Food. An Encyclopedia*. Rowman and Littlefield, Lanham. Pp. 546-548

Fuller, D. Q. and Lisa Hildebrand (2013) Domesticating Plants in Africa. In *The Oxford Handbook of African Archaeology*. Edited by Peter Mitchell and Paul Lane. Oxford: Oxford University Press. Pp. 507-525. Online

Fuller, D. Q. and Charlene Murphy (2018) Agricultural origins and frontiers in the Indian Subcontinent: a current synthesis. In *Beyond Stones and More Stones, Volume 2. Domestication of the Indian Subcontinent* (ed. Ravi Korisettar). Bangalore: The Mythic Society. Pp. 15-94

Harlan, J. 1992. Crops and Man, second edition. Madison: American Society of Agronomy. *This is more general and global than Zohary and Hopf (see below) and it has good overviews on maize origins, African crop origins, and an increasingly dated summary on East Asia*.

Harlan, J. 1995. *The Living Fields*. Cambridge: Cambridge University Press. *A more synoptic abstract of Harlan 1992.*

Hillman, G.C. 1996. Late Pleistocene changes in wild plant-foods available to huntergatherers of the northern Fertile Crescent: possible preludes to cereal cultivation. In *The Origins and spread of agriculture and pastoralism in Eurasia*, ed. D.R. Harris, 159-203. University College London Press: London.

Simoons, F. J. 1991. *Food in China: A Cultural and Historical Inquiry*. Baton Rouge: CRC Press

Willcox, G. 2005. The distribution, natural habitats and availability of wild cereals in relation to their domestication in the Near East: multiple events, multiple centres. *Vegetation History and Archaeobotany* 14, 534-541.

Zohary, D., Hopf, M. and Weiss, E. 2012. Domestication of Plants in the Old World, 4th edition. Oxford: Oxford University Press. [earlier editions are found under INST ARCH HA ZOH; Online: Online:https://oxford-universitypressscholarship-

com.libproxy.ucl.ac.uk/view/10.1093/acprof:osobl/9780199549061.001.0001/acprof-9780199549061

SYLLABUS (Sessions topics and reading list)

1. Introductory session- with four sub-topics.

1A. Fruits, Seeds and seed-alikes: defining basic categories
1B. Turning flowers into fruits: Examples of the Solanaceae and
1C. A brief introduction to taxonomic nomenclature, phylogenetic systems, and the evolution of seeds
1D. Cereal Identification Part 1: grasses & cereals (Poaceae), an overview- barley, wheat, rice, a few millets

Essential Readings
Fuller, D.Q. [n.d.] *Seeds for the Archaeologist,* Chapters 1-7. [*also to be provided as a handout]*
1A. Esp. chapter 3
1B. esp. chapter 4
1C. Chapter 6 [through §6.6]; also look at Chapter 20 on the evolution of seeds (after the lecture).
1D. Chapter 7. With additional reference to illustrations in Chapters 8 and

Some alternative readings

Additional/Further Reading
Rudall, Paula. 2020. *Anatomy of Flowering Plants. An Introduction to Plant Structure and Development*, 4th edition. Cambridge University Press. Look at *Preface, Chapter 6* (pp. 95-106).
https://www-cambridge-org.libproxy.ucl.ac.uk/core/books/anatomy-of-flowering-plants/2551225E3C7EB688D1E344728D5B7FA8

Cappers, Rene and Reinder Neef. 2012. *Handbook of Plant Palaeoecology.* Groningen, Netherlands : Barkhuis, University of Groningen Library. 13-46 [1.1-1.2.4]
Online: https://www-jstor-org.libproxy.ucl.ac.uk/stable/j.ctt20p56g8

Essig, Frederick B. 2015. *Plant Life. A Brief History.* Oxford University Press.
Useful general overview of plant evolution

Simpson, Michael (2019) *Plant Systematics,* Third Edition. New York: Academic Press.
Online: https://www-sciencedirect-com.libproxy.ucl.ac.uk/book/9780128126288/plant-systematics
A key reference work to consult on plant evolution and key families [not all families are treated in this book]

Mabberley, D. J. (2008). *The Plant Book,* third edition. Cambridge University Press.

A very handy book with listing of all families and genera, indicating basics of distribution, economic species and some common synonyms. Various editions available; older editions still useful. 4th edition (2017), available online: https://www.cambridge.org/core/books/mabberleys-plantbook/B1245736E70AF37DCB680659D5C981F7

Percival, John 1946 [or earlier editions!] *Agricultural Botany*, Eighth edition. Duckworth. [Chapter 8. The Fruit] -*note: this out of print book is often available secondhand at low prices, and the basics of crop structure and plant morphology has not changed since Percival's day; a useful resource to have on hand.* The very useful 4th edition [1910] is available from biodiversity heritage library: https://www.biodiversitylibrary.org/bibliography/56806

Robbins, Wilfred W. (1917) *The Botany of Crop Plants.* Philadelphia: P. Blakikstan's son & Co. Available online from archive.org or the biodiversity heritage library: https://www.biodiversitylibrary.org/bibliography/42922

2. An introduction to major cereal and pulse crops [and pseudo-cereals]

2B. Cereal Identification Part 2: wheats, rye, oats and related grasses

Essential Readings, for 2B

Zohary, D., Hopf, M. and Weiss, E. 2012. *Domestication of Plants in the Old World*, 4th edition. Oxford: Oxford University Press. See Chapter 3 "Cereals". Online:https://oxford-universitypressscholarship-com.libproxy.ucl.ac.uk/view/10.1093/acprof:osobl/9780199549061.001.0001/acprof-9780199549061

Fuller, *Seeds for the Archaeologist,* Chapters 8-9.
Note that Chapter 24, provides a broader overview on grass evolution and for dealing with wild grasses.

For 2C

Fuller, *Seeds for the Archaeologist,* Chapter 15. Pulses

For 2D

Fuller, *Seeds for the Archaeologist,* Chapter 22. Polygonaceae versus Cyperaceae
With addition info on Sedges in Chapter. 23.
Chapter 14. Pseudo-cereals

Further Readings (cereals)

Chapman, G. P. (ed.) 1992. Grass Evolution and Domestication. Cambridge University Press. *Especially pay attention to Chaps 1-2, 5-7* [INST ARCH BB 5 CHA; BOTANY 84 g CHA]. *NB: This book includes a comprehensive list of C-4 Grass Genera*.

Harlan, J. 1992. *Crops and Man.* Madison: American Society of Agronomy. see Chapter 6:

"Dynamics of Domestication"

Harlan, J.R., De Wet, J.M.J. and Price, E.G., 1973. Comparative evolution of cereals. *Evolution*, *27*(2), pp.311-325.

Fuller, Dorian Q (2021) A Series of Cereals: A Global Archaeology of Domestication, Cereal Agriculture and Staple Foods. Chapter 1 in: Raymond Cooper (ed.) Ancient Grains in Modern Soils, Destech Publishers, Lancaster, Pennsylvania.

Allaby, Robin G., Chris J. Stevens, Logan Kistler and Dorian Q Fuller (2021) The emerging evidence for plant domestication as a landscape level process. *Trends in Evolution and Ecology*: #2394. https://doi.org/10.1016/j.tree.2021.11.002

Ishikawa, R., Castillo, C.C. and Fuller, D.Q., 2020. Genetic evaluation of domestication-related traits in rice: implications for the archaeobotany of rice origins. Archaeological and Anthropological Sciences, 12(8), pp.1-14.

Weide, A., Riehl, S., Zeidi, M. and Conard, N.J., 2018. A systematic review of wild grass exploitation in relation to emerging cereal cultivation throughout the Epipalaeolithic and aceramic Neolithic of the Fertile Crescent. *PloS one*, 13(1), p.e0189811.

Further Readings (pulses)

Fuller, D.Q. and Harvey, E.L., 2006. The archaeobotany of Indian pulses: identification, processing and evidence for cultivation. *Environmental archaeology*, *11*(2), pp.219-246.

Fuller, D.Q. and Murphy, C., 2018. The origins and early dispersal of horsegram (Macrotyloma uniflorum), a major crop of ancient India. *Genetic resources and crop evolution*, *65*(1), pp.285-305.

Fuller, D.Q., Murphy, C., Kingwell-Banham, E., Castillo, C.C. and Naik, S., 2019. Cajanus cajan (L.) Millsp. origins and domestication: the South and Southeast Asian archaeobotanical evidence. *Genetic Resources and Crop Evolution*, *66*(6), pp.1175-1188.

Murphy, C. and Fuller, D.Q., 2017. Seed coat thinning during horsegram (Macrotyloma uniflorum) domestication documented through synchrotron tomography of archaeological seeds. *Scientific reports*, *7*(1), pp.1-9.

Caracuta, V., Vardi, J., Paz, Y. and Boaretto, E., 2017. Farming legumes in the pre-pottery Neolithic: New discoveries from the site of Ahihud (Israel). *PloS one*, *12*(5), p.e0177859.

Lee, G.A., Crawford, G.W., Liu, L., Sasaki, Y. and Chen, X., 2011. Archaeological soybean (Glycine max) in East Asia: does size matter?. *PloS one*, *6*(11), p.e26720.

Kerem, Z., Lev-Yadun, S., Gopher, A., Weinberg, P. and Abbo, S., 2007. Chickpea domestication in the Neolithic Levant through the nutritional perspective. *Journal of Archaeological Science*, *34*(8), pp.1289-1293.

Abbo, S., Shtienberg, D., Lichtenzveig, J., Lev-Yadun, S. and Gopher, A., 2003. The chickpea, summer cropping, and a new model for pulse domestication in the ancient Near East. *The Quarterly Review of Biology*, *78*(4), pp.435-448.

Tarongi, M., Prats, G. and Alonso, N., 2020. The storage of pulses during the Bronze and Iron Ages in the East of the Iberian Peninsula: Examining the archaeological data through the lens of ethnography. *Journal of Archaeological Science: Reports,* 30, p.102174.

3A-B. Cereal sorting and crop-processing

This session will start with a chance to sort archaeobotanical flotation samples (from Romano-British Droitwich), which are rich in cereal grains, chaff and some weed seed. This provide a hand on chance to identify wheat glumes and some weeds, leading on to discussion of crop-processing and relevant quantification.

Essential Readings:

Fuller, D.Q. [n.d.] *Seeds for the Archaeologist,* Chapter 13. [*also to be provided as a handout]*

Van der Veen, M. and Jones, G., 2006. A re-analysis of agricultural production and consumption: implications for understanding the British Iron Age. *Vegetation History and Archaeobotany*, 15(3), pp.217-228.

Fuller, Dorian Q, Chris Stevens and Meriel McClatchie (2014). Routine activities, tertiary refuse, and Labor organization. Social inferences from everyday archaeobotany. In Ancient Plants and People. Contemporary Trends in Archaeobotany, edited by Marco Madella, Carla Lancelotti and Manon Savard. Tucson: University of Arizona Press. Pp. 174-217 ONLINE: https://www-jstor-org.libproxy.ucl.ac.uk/stable/j.ctt1814hr4

Stevens, C. J. (2015) Intersite variation within archaeobotanical Marston, J.M., Guedes, J.D.A. and Warinner, C. eds., 2015. *Method and theory in paleoethnobotany*. University Press of Colorado. [INST ARCH BB 5 MAR] Online: https://muse-jhu-edu.libproxy.ucl.ac.uk/book/38157

Antolin, F. and Buxo R. 2011. Proposal for the systematic description and taphonomic study of carbonized cereal grain assemblages: a case study of an early Neolithic funerary context in the cave of Can Sadurnı´ (Begues, Barcelona province, Spain) *Veget Hist Archaeobot* 20:53–66

3C. observing cereal chaff, cereal grain measurements and sorting practice

This session will introduce worksheets prepared by Dr. Sue Colledge to aid the observation of cereal grains and chaff, especially wheats, to help identification to species level/ploidy level in wheats. The use of measurements will also be discussed. This discussion will lead into

Essential Readings:

Fuller, D.Q. [n.d.] *Seeds for the Archaeologist,* Chapters 8, with example of worksheets at the end of the chapter. 12. On measurements

Jones, G., 1998. Wheat grain identification–why bother?. *Environmental Archaeology*, 2(1), pp.29-34.

Further Readings

Fuller, Dorian Q., Sue Colledge, Charlene Murphy & Chris J. Stevens (2017). Sizing up cereal variation: patterns in grain evolution revealed in chronological and geographical comparisons. In: Miscelánea en homenaje a Lydia Zapata Peña (1965-2015). Edited by Javier Fernández Eraso, José Antonio Mujika Alustiza, Álvaro Arrizabalaga Valbuena, Marcos García Díez. Bilbao: Servicio Editorial Universidad Del País Vasco. Pp. 131-149 [pdf available from instructor]

Kohler-Schneider, M., 2003. Contents of a storage pit from late Bronze Age Stillfried, Austria: another record of the" new" glume wheat. *Vegetation History and Archaeobotany*, 12(2), pp.105-111.

Ulaş, B. and Fiorentino, G., 2020. Recent attestations of "new" glume wheat in Turkey: a reassessment of its role in the reconstruction of Neolithic agriculture. *Vegetation History and Archaeobotany*, pp.1-17.

Charles, Mike, Dorian Q Fuller, Tina Roushannafas, and Amy Bogaard (2021) An assessment of crop plant domestication traits at Çatalhöyük. In: Ian Hodder (ed.) *Peopling the Landscape of Çatalhöyük. Reports from the 2009-2017 Seasons*. British Institute at Ankara Monograph 53. London: British Institute at Ankara. Pp. 125-136 [pdf available from instructor]

Liu, X., Lister, D.L., Zhao, Z., Staff, R.A., Jones, P.J., Zhou, L., Pokharia, A.K., Petrie, C.A., Pathak, A., Lu, H. and Matuzeviciute, G.M., 2016. The virtues of small grain size: Potential pathways to a distinguishing feature of Asian wheats. *Quaternary International*, 426, pp.107-119.

Bonhomme, Vincent, Emily Forster, Michael Wallace, Eleanor Stillman, Michael Charles, and Glynis Jones. (2017) Identification of inter-and intra-species variation in cereal grains through geometric morphometric analysis, and its resilience under experimental charring. *Journal of Archaeological Science* 86: 60-67.

DAY 4.

4A. An overview of nuts, and selected fruits.
4B. Cucurbits
4C. Oilseeds, Fibre crops- esp. Asteraceae, Brassicaceae, Malvaceae, Lamiaceae, Linaceae, Pedaliaceae
4D. Cereal identification Part 4. Millets

Essential Readings

4A

Fuller, D.Q. [n.d.] *Seeds for the Archaeologist,* Chapter 18; skim Chapter 19.

Fuller, D.Q., 2018. Long and attenuated: comparative trends in the domestication of tree fruits. Vegetation history and archaeobotany, 27(1), pp.165-176.

Zohary Hopf and Weiss 2012, Chapter 6

4B
Fuller, D.Q. [n.d.] *Seeds for the Archaeologist,* Chapter 17.

4C
Fuller, D.Q. [n.d.] *Seeds for the Archaeologist,* Chapter 16.

Brinkkemper, O., 2018. Oils and Fibers. The Encyclopedia of Archaeological Sciences, pp.1-3. Wiley. Online: https://onlinelibrary.wiley.com/doi/full/10.1002/9781119188230.saseas0418

Zohary Hopf and Weiss 2012, Chapter 5

4D Millets
Fuller, D.Q. [n.d.] *Seeds for the Archaeologist,* Chapter 11 *handout].*

Fuller, D. Q. (2014) Millets: Origins and Development. In *Encyclopedia of Global Archaeology* (Claire Smith, Ed.). Springer, New York. pp 4945-4948. [Online]

Further Readings
nuts
Hosoya, L.A. 2011. Staple or famine food?: ethnographic and archaeological approaches to nut processing in East Asian prehistory. Archaeol Anthropol Sci 3: 7. doi:10.1007/s12520-011-0059-y

López-Dóriga, I.L. 2015 An experimental approach to the taphonomic study of charred hazelnut remains in archaeological deposits. Archaeol Anthropol Sci 7: 39. doi:10.1007/s12520-013-0154-3

Melamed, Y., Kislev, M.E., Geffen, E., Lev-Yadun, S. and Goren-Inbar, N., 2016. The plant component of an Acheulian diet at Gesher Benot Ya ʻaqov, Israel. *Proceedings of the National Academy of Sciences,* 113(51), pp.14674-14679.

Menninger, E. A. 1977. *Edible Nuts of the World*. Horticultural Books, Stuart, Fl.

Rosengarten, F., Jr. 1984. *The Book of Edible Nuts*. Walker New York)

Takahashi R, Hosoya L.A.. 2002. Nut exploitation in Jomon Society. In: Mason SLR, Hather JG (eds) *Hunter–gatherer archaeobotany: perspective from the northern temperate zone*. University College London Press, London, pp 146–155

Wang, J. and Jiang, L., 2021. Intensive acorn processing in the early Holocene of southern China. *The Holocene,* p.09596836211041732.

fruits

Cornille, A., Antolín, F., Garcia, E., Vernesi, C., Fietta, A., Brinkkemper, O., ... & Roldán-Ruiz, I. (2019). A multifaceted overview of apple tree domestication. Trends in Plant Science. 24(8), 770-782

Fuller, Dorian Q, Cristina Castillo, Eleanor Kingwell-Banham, Ling Qin and Alison Weisskopf (2018) Charred pomelo peel, historical linguistics and other tree crops: approaches to framing the historical context of early Citrus cultivation in East, South and Southeast Asia. In: Véronique Zech, Girolamo Fiorentino, Sylvie Coubray (eds) *The History and Archaeology of the citrus fruit from the Far East to the Mediterranean: introductions, diversifications, uses.* Naples: Centre Jean Bérard. Pp. 31-50. https://books.openedition.org/pcjb/2173

Fuller, Dorian Q and Stevens, Chris J. (2019) Between domestication and civilization: the role of agriculture and arboriculture in the emergence of the first urban societies. Vegetation History and Archaeobotany 28: 263-282

Pagnoux, C., A. Celant, S. Coubray, G. Fiorentino, V. Zech-Matterne (2013), The introduction of Citrus to Italy, with reference to the identification problems of seed remains, *Vegetation History and Archaeobotany*, 22, 5, p. 421-438.

Pagnoux C, Bouby L, Ivorra S, Petit C, Valamoti SM, Pastor T, Picq S, Terral JF (2015) Inferring the agrobiodiversity of Vitis vinifera L.(grapevine) in ancient Greece by comparative shape analysis of archaeological and modern seeds. *Veget Hist Archaeobot* 24:75–84

Oilseeds and cucurbits

Bates, J., 2019. Oilseeds, spices, fruits and flavour in the Indus civilisation. *Journal of Archaeological Science: Reports*, 24, pp.879-887.

Bedigian, D. 2004. History and lore of Sesame in Southwest Asia, Economic Botany 58(3): 329-353

Bergfjord, C., Mannering, U., Frei, K. et al. (2012) Nettle as a distinct Bronze Age textile plant. *Scientific Reports* 2, 664. https://doi.org/10.1038/srep00664

Boesewinkel, F. D. 1984. A comparative SEM study of the seed coats of recent and of 900-1100 years old, subfossil linseed, Berichte der Deutschen Botanischen Gesellschaft 97: 4430450

Bouchaud, C., Yvanez, E. and Wild, J.P., 2019. Tightening the thread from seed to cloth. New enquiries in the archaeology of Old World cotton. A case for inter-disciplinarity. Revue d'ethnoécologie, (15). Online: https://journals.openedition.org/ethnoecologie/4501

Decker-Walters, D. S. and Walters, T. W. 2000. Squash, in *Cambridge World History of Food*, Pp. 335-350 [INST ARCH HC KIP; ANTHROPOLOGY E 72 KIP]

Fuller, D. 200.3 "Further Evidence on the Prehistory of Sesame" Asian Agri-History 7(2): 127-137 [PDF on moodle]

Fuller, D. Q (2008) The spread of textile production and textile crops in India beyond the Harappan zone: an aspect of the emergence of craft specialization and systematic trade. In *Linguistics, Archaeology and the Human Past* Occasional Paper 3, edited by T. Osada and A. Uesugi. Indus Project, Research Institute for Humanity and Nature, Kyoto. Pp. 1-26 [PDF on moodle]

Karg, S., 2011. New research on the cultural history of the useful plant *Linum usitatissimum* L.(flax), a resource for food and textiles for 8,000 years. *Vegetation History and Archaeobotany*, 20(6), pp.507-508.

Marinova, E. and Riehl, S., 2009. Carthamus species in the ancient Near East and south-eastern Europe: archaeobotanical evidence for their distribution and use as a source of oil. *Vegetation history and archaeobotany*, 18(4), pp.341-349.

Maynard, D. and Maynard, D. N. 2000. Cucumbers, Melons and Watermelons, in *Cambridge World History of Food*. Pp. 298-312 [INST ARCH HC KIP; ANTHROPOLOGY E 72 KIP]

Paris, H.S., 2016. Overview of the origins and history of the five major cucurbit crops: issues for ancient DNA analysis of archaeological specimens. *Vegetation History and Archaeobotany*, 25(4), pp.405-414.

Qiu, Z., Zhang, Y., Bedigian, D., Li, X., Wang, C. and Jiang, H., 2012. Sesame utilization in China: new archaeobotanical evidence from Xinjiang. *Economic botany,* 66(3), pp.255-263.

Sabato, D., Esteras, C., Grillo, O., Peña-Chocarro, L., Leida, C., Ucchesu, M., Usai, A., Bacchetta, G. and Picó, B., 2019. Molecular and morphological characterisation of the oldest Cucumis melo L. seeds found in the Western Mediterranean Basin. *Archaeological and Anthropological Sciences*, 11(3), pp.789-810.

Schaefer, H. and Renner, S.S. (2020), Cucumis melo is among the Few Species Independently Domesticated Three Times and on Two Continents. *Cucurbit Genetics Cooperative Report* 43: 12-13

Wolcott, K.A., Chomicki, G., Staedler, Y.M., Wasylikowa, K., Nesbitt, M., Schönenberger, J. and Renner, S.S., 2021. Three-dimensional X-ray-computed tomography of 3300-to 6000-year-old Citrullus seeds from Libya and Egypt compared to extant seeds throws doubts on species assignments. Plants, People, Planet, 3(6), pp.694-702.

Vaughan, J. G. 1970. *The Structure and Utilization of Oil Seeds*. London: Chapman and Hall

millets

Indian millets

Weber, S.A. and Fuller, D.Q., 2008. Millets and their role in early agriculture. *Pragdhara*, *18*(69), p.e90.

Kingwell-Banham, Eleanor and DQ Fuller (2014) Brown Top Millet: Origins and Development. In *Encyclopedia of Global Archaeology* (Claire Smith, Ed.). Springer, New York. pp 1021-1024 [Online]

García-Granero, J.J., Arias-Martorell, J., Madella, M. and Lancelotti, C., 2016. Geometric morphometric analysis of Setaria italica (L.) P. Beauv.(foxtail millet) and Brachiaria ramosa (L.) Stapf.(browntop millet) and its implications for understanding the biogeography of small millets. *Vegetation History and Archaeobotany*, 25(3), pp.303-310.

Chinese millets
Song, J., Zhijun, Z. and Fuller, D.Q. 2013. The archaeobotanical significance of immature millet grains: an experimental case study of Chinese millet crop processing.
Vegetation History and Archaeobotany 22: 141-152
Stevens, C.J., Shelach-Lavi, G., Zhang, H., Teng, M. and Fuller, D.Q., 2021. A model for the domestication of Panicum miliaceum (common, proso or broomcorn millet) in China. *Vegetation History and Archaeobotany,* 30(1), pp.21-33.

Pearl millet
Fuller, D.Q., Barron, A., Champion, L., Dupuy, C., Commelin, D., Raimbault, M. and Denham, T., 2021. Transition From Wild to Domesticated Pearl Millet (Pennisetum glaucum) Revealed in Ceramic Temper at Three Middle Holocene Sites in Northern Mali. *African Archaeological Review*, *38*(2), pp.211-230.

Sorghum
Fuller D.Q., Stevens C.J. (2018) Sorghum Domestication and Diversification: A Current Archaeobotanical Perspective. In: Mercuri A., D'Andrea A., Fornaciari R., Höhn A. (eds) *Plants and People in the African Past*. Springer, Cham, pp.427-452

Finger millet
Fuller, D. Q. (2014) Finger Millet: Origins and Development. In *Encyclopedia of Global Archaeology* (Claire Smith, Ed.). Springer, New York. pp 2783-2785 [Online]

Mueller, N.G., Goldstein, S.T., Odeny, D. and Boivin, N., 2021. Variability and preservation biases in the archaeobotanical record of Eleusine coracana (finger millet): evidence from Iron Age Kenya. Vegetation History and Archaeobotany, pp.1-12.

Tef
D'Andrea, A.C., 2008. T'ef (Eragrostis tef) in ancient agricultural systems of highland Ethiopia. *Economic Botany*, *62*(4), pp.547-566.

Wild grasses
Nesbitt, Mark 2006. *Identification Guide for Near Eastern Grass Seeds*. UCL Institute of Archaeology Publications

5. wild plant seeds, selected families

5A. Gymnosperms and Basal Angiosperms

5B. An introduction to monocots
5C. Higher Eudicot trends: towards curled embryos and trigonous seeds- Solanalese vs. Caryophyllales

Essential Readings

5A. Fuller, D.Q. [n.d.] *Seeds for the Archaeologist,* Chapters 21, 28-30
5B. Fuller, D.Q. [n.d.] *Seeds for the Archaeologist,* Chapters 25-27
5C. Fuller, D.Q. [n.d.] *Seeds for the Archaeologist,* Chapters 32-34

FUTHER READINGS

Simpson, Michael (2019) *Plant Systematics,* Third Edition. New York: Academic Press.
Chapter 7 section on "Monocotyledons" and *Chapter 8 Sections on "Eudicots"* and *"Caryophyllales"*
Online: https://www-sciencedirect-com.libproxy.ucl.ac.uk/book/9780128126288/plant-systematics

Additional Families

Fuller, D.Q. [n.d.] *Seeds for the Archaeologist,* Chapters 35-41

Appendix A. Some sources on other types of archaeobotanical evidence (Not covered during the practical sessions in this course.)

A.1. TUBERS, PARENCHYMA TISSUES

Hather, J.G. 1994. A morphological classification of roots and tubers and its bearing on the origins of agriculture in southwest Asia and Europe. Journal of Archaeological Science 21, 719-724.

Kubiak-Martens, L. 1996. Evidence for possible use of plant foods in Palaeolithic and Mesolithic diet from the site of Całowanie in the central part of the Polish Plain. Veget. Hist. Archaeobot 5, 33-38.

Ugent. D., Pozorski, S. and Pozorski, T. 1982. Archaeological Potato Tuber Remains from the Casma Valley of Peru. Economic Botany 36, 182-192.

Hather, J. 2000. Archaeoological 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]

Matthews, P.J. 2004. Genetic diversity in taro, and the preservation of culinary knowledge. Ethnobotany Research & Applications 2, 55-71

H. H. Norton , E. S. Hunn , C. S. Martinsen & P. B. Keely (1984) Vegetable food products of the foraging economies of the pacific northwest, Ecology of Food and Nutrition 14:3, 219-228, DOI: 10.1080/03670244.1984.9990789 SEE TABLE II

Wollstonecroft, M., Ellis, P. R., Hillman, G. C. and Fuller, D.Q. 2008. Advances in plant food processing in the Near Eastern Epipalaeolithic and implications for improved edibility and nutrient bioaccessibility: an experimental assessment of Bolboschoenus maritimus (L.) Palla (sea club-rush). Vegetation History and Archaeobotany DOI 10.1007/s00334-008-0162-x

Yen, D. E. 1993 The origins of subsistence agriculture in Oceania and the potentials for future tropical food crops. Economic Botany 47(1):3-14. 1993.

Denham, T., Barton, H., Castillo, C., Crowther, A., Dotte-Sarout, E., Florin, S.A., Pritchard, J., Barron, A., Zhang, Y. and Fuller, D.Q., 2020. The domestication syndrome in vegetatively propagated field crops. Annals of Botany, 125(4), pp.581-597.

A.2. Wood

Allué, E., Murphy, C., Kingwell-Banham, E., Bohingamuwa, W., Adikari, G., Perera, N., Boivin, N. and Fuller, D.Q., 2021. A step forward in tropical anthracology: understanding woodland vegetation and wood uses in ancient Sri Lanka based on charcoal records from Mantai, Kirinda and Kantharodai. Quaternary International, 593, pp.236-247.

Asouti, E. and Austin, P., 2005. Reconstructing woodland vegetation and its exploitation by past societies, based on the analysis and interpretation of archaeological wood charcoal macro-remains. Environmental Archaeology, 10(1), pp.1-18.

Asouti, E. and Kabukcu, C., 2021. Anthracology: Charcoal Science in Archaeology and Palaeoecology. Quaternary International, 593, pp.1-5.

Asouti, E. and Fuller, D. 2008. Trees and Woodlands in South India: An Archaeological Perspective. Left Coast Press, Walnut Creek

Fahn, A., Werker, E. and Baas, P. 1986. Wood anatomy and identification of trees and shrubs from Israel and adjacent regions / by. Jerusalem: Israel Academy of Sciences and Humanities, 1986 INST ARCH BB 5 FAH

Gale and Cutler 2000. Plants in Archaeology, Chap. 1. Materials and Methods. [INST ARCH BB 51 Qto GAL]

Hather, J. 2000. The Identification of Northern European Woods. Archetype. Part One: Introduction INST ARCH KC HAT

IAWA Commitee (H.G. Richter, D. Grosser, I. Heinz & P.E. Gasson, Eds). (2004). 'IAWA list of microscopic features for softwood identification.' Repr. IAWA Journal 25: 1-70.

IAWA Commitee (E.A. Wheeler, P. Baas & P. Gasson, Eds). (1989). 'IAWA list of microscopic features for hardwood identification.' Repr. IAWA Journal 10: 219-332.

Schweingruber, F. H. 1990. Anatomie europäischer Hölzer: ein Atlas zur Bestimmung europäischer Baum-, Strauch-, und Zwergstrauchhölzer (Anatomy of European woods: an altas for the identification of European trees, shrubs, and dwarf shrubs). [INST ARCH BB 51 SVH (copy held in Rm 306)]

Schweingruber, F. H. (1990). Microscopic Wood Anatomy: Structural Variability of Stems and Twigs in Recent and Subfossil Woods from Central Europe. Teufen: F. Flück-Wirth

A.3. Cooked foods, or charred multicomponent food aggregates

Hillman, G., Wales, S., McLaren, F. , Evans, E. & Butler, A. 1993. .Identifying problematic remains of ancient plant foods: A comparison of the role of chemical, histological and morphological criteria, World Archaeology, 25:94-121 DOI:10.1080/00438243.1993.9980230

Kubiak-Martens, L. Brinkkemper, O. Oudemans, T.F.M. 2015. What's for dinner? Processed food in the coastal area of the nornern Netherlands in the Late Neolithic. Veget. Hist. Archaeobot 24, 47-62.

Carretero, L.G., Wollstonecroft, M. and Fuller, D.Q., 2017. A methodological approach to the study of archaeological cereal meals: a case study at Çatalhöyük East (Turkey). Vegetation history and archaeobotany, 26(4), pp.415-432.

Fuller, D.Q. and Gonzalez Carretero, L., 2018. The archaeology of Neolithic cooking traditions: archaeobotanical approaches to baking, boiling and fermenting. Archaeology International, 21(1), pp.109-121.

Arranz-Otaegui, A., Carretero, L.G., Ramsey, M.N., Fuller, D.Q. and Richter, T., 2018. Archaeobotanical evidence reveals the origins of bread 14,400 years ago in northeastern Jordan. Proceedings of the National Academy of Sciences, 115(31), pp.7925-7930.

Heiss, A.G., Pouget, N., Wiethold, J., Delor-Ahü, A. and Le Goff, I., 2015. Tissue-based analysis of a charred flat bread (galette) from a Roman cemetery at Saint-Memmie (Dép. Marne, Champagne-Ardenne, north-eastern France). Journal of Archaeological Science, 55, pp.71-82.

Heiss, A.G., Antolín, F., Bleicher, N., Harb, C., Jacomet, S., Kühn, M., Marinova, E., Stika, H.P. and Valamoti, S.M., 2017. State of the (t) art. Analytical approaches in the investigation of components and production traits of archaeological bread-like objects, applied to two finds from the Neolithic lakeshore settlement Parkhaus Opéra (Zürich, Switzerland). PLoS One, 12(8), p.e0182401.

Valamoti, S. M., Samuel, D., Bayram, M., Marinova, E. (2008). Prehistoric cereal foods from Greece and Bulgaria: investigation of starch microstructure in experimental and archaeological charred remains. Vegetation History and Archaeobotany 17(1), 265-276.

Valamoti, S.M., Marinova, E., Heiss, A.G., Hristova, I., Petridou, C., Popova, T., Michou, S., Papadopoulou, L., Chrysostomou, P., Darcque, P. and Grammenos, D., 2019. Prehistoric

cereal foods of southeastern Europe: an archaeobotanical exploration. Journal of Archaeological Science, 104, pp.97-113.

Bates, J., Black, K.W. and Morrison, K.D., 2022. Millet bread and pulse dough from early Iron Age South India: Charred food lumps as culinary indicators. Journal of Archaeological Science, 137, p.105531.

A.4 Phytoliths

Fahn, A. 1990. Plant Anatomy. Chap. 10. Epidermis, Pp. 152-180

Fred lund, G. G. and Tieszen, L. T. 1994. Modern phytololith assemblages from the North American Great Plains, Journal of Biogeography 21: 321-335 [can be downloaded through college network from www.jstor.org]

Madella, M. and Zurro, D. (eds.) 2007. Plants, People and Places. Recent Studies inPhytolith Analysis. Oxford: Oxbow Books.

Madella, M., Alexandre, A. Ball, T. 2005. International code for phytolith nomenclature 1.0, Annals of Botany 151: 172-180 [can be downloaded through college network from www.aob.oupjournals.org]

International Committee for Phytolith Taxonomy (ICPT) Neumann Katharina, de Strömberg Caroline AE Ball Terry Albert Rosa Maria Vrydaghs Luc Cummings Linda Scott, 2019. International code for phytolith nomenclature (ICPN) 2.0. Annals of Botany, 124(2), pp.189-199.

Powers, A. H. 1992. Great expectations: a short historical review of European phytolith systematics, in Phytoliths Systematics (Rapp, G. Jr. and S. C. Mulholland eds.), pp. 15-35. New York: Plenum Press [and other chapters in this book: INST ARCH BB 5 RAP]

Pearsall, D. M. and Trimble, M. K. 1984. Identifying Past Agricultural Activity through Soil Phytolith Analysis: a Case Study from the Hawaiian Islands, Journal of Archaeological Science 11: 119-133 [INST ARCH PERS; teaching collection]
26

Pearsall, D. 2000. Paleoethnobotany, Second Edition. Chapter 5, especially pp. 355-411 & pp 491-496

Pearsall, D. M. and Piperno, D.R. (eds.) 1993. Current research in phytolith analysis: applications in archaeology and paleoecology. Philadelphia: MASCA, The University Museum of Archaeology and Anthropology, University of Pennsylvania

Piperno, D. R.1988. Phytolith analysis: an archaeological and geological perspective. New York: Academic Press [INST ARCH BB 5 PIP]

Piperno, D. R. 2006. Phytoliths : a comprehensive guide for archaeologists and paleoecologists. Lanham, Md. : AltaMira Press. Rosen, A. M. 2000. Phytolith

analysis in Near Eastern archaeology, in The Practical Impact of Science on Near Eastern and Aegean Archaeology (S. Pike and S. Gitin eds.), Weiner Laboratory Monograph 3. London: Archaetype Publications.