



**UCL Institute of Archaeology**  
**ARCL0128 RESOURCES AND SUBSISTENCE**

2023-24, Term 2

MA/MSc module  
15 credits

Co-ordinator: Dorian Q Fuller  
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Room 311, phone 2 4771 [020-7679 4771], office hours: Wednesday: 11am-Noon, Friday, 2pm-3pm,  
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**OTHER CONTRIBUTING INSTRUCTORS:**

Professor Louise Martin ([Louise.martin@ucl.ac.uk](mailto:Louise.martin@ucl.ac.uk))

Teaching Assistant : Anna Den Hollander ([anna.hollander.18@ucl.ac.uk](mailto:anna.hollander.18@ucl.ac.uk))



Course sessions: Wednesdays 9am-11am, **Room 410**, Institute of Archaeology

## 1. MODULE OVERVIEW

### Module description

This course is intended to provide the theoretical grounding for practical projects in examining past subsistence systems through archaeozoology, archaeobotany, and geoarchaeological approaches. The seminars, readings and assignments cover the most important theoretical debates and methodological issues in the archaeological study of human subsistence, changes in subsistence practices and related human modifications of environments. The course consists of 10 x 2-hour sessions, by a mixture of lectures by the instructor(s) and seminar discussions, and presentations by students. Note: student presentations are required but do not affect the final mark.

### Module Aims

This course is intended to provide the theoretical grounding for practical projects on past subsistence systems, subsistence change and related human modifications of environments using archaeozoology, archaeobotany, and/or geoarchaeological approaches. Altogether, the lectures, readings, class discussions, and assignments are designed to facilitate an improved understanding of the many forms and degrees of human-environment interactions, particularly human interactions with and influences on other organisms within their environments.

### Learning Outcomes

#### ***On successful completion of this course a student should:***

- understand current debates about hunter-gatherer's subsistence, agricultural origins, intensification and social and cultural aspects of food procurement and production systems, as well as issues in human dietary selection, food preparation and consumption; and,
- be familiar with a wide range of case studies and data sets, their problems and possible interpretations, in order to
- be able to contribute constructively to knowledge-based debates on a range of current issues in past human resource use and major transitions in subsistence mode; and able to
- recognise and situate archaeological plant and/or animal assemblages within the spectrum of human subsistence system.

#### ***Enhanced skills in:***

- Critical analysis of theoretical models and arguments;
- Understanding of technical archaeozoology and archaeobotany publications;
- Comprehension of technical jargon relevant to subsistence, domestication and intensification, including arguments about how these issues are interpreted from archaeological datasets;
- Written analysis and presentation of ideas;
- Formal and informal oral presentation of ideas.

### Methods of Assessment

**In this course, students are marked on two written assignments. *Note: that course co-ordinators will return your coursework after first marking within 4 weeks of submission.***

## Communications

- **Moodle is the main hub** for this course.
- 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.

Week-by-week summary

**Room 410, Wednesdays, 9am-11am**

Week	Date	Topic	Lecturers
1	4 Oct	Hunter-Gatherers-Fishers: foragers or collectors?	DQF
2	11 Oct	Hunting and fishing strategies, broad spectrum adaptations	LM
3	18 Oct	PLANT DOMESTICATION, AGRICULTURAL ORIGINS, and INTERMEDIATE ECONOMIES with a focus on the Near East	DQF
4	25 Oct	ANIMAL DOMESTICATION	LM
5	1 Nov	Alternative pathways to agriculture: vegiculture, arboriculture, lowland and highland tropics	DQF
6		READING WEEK [6-10 Nov.]/ [Biomolecular short course]	
7	15 Nov.	<b>Student presentations:</b> comparing subsistence adaptations	AdH/ DQF
8	22. Nov	Genetics, ancient DNA and its contribution to studying, domestication, agricultural transformations and migrations	DQF
9	29 Nov.	Animal Secondary Products	LM
10	6 Dec.	Agricultural Intensification and Land Use	DQF
11	13 Dec.	Complex societies: Producers, Consumers, The Scale Of Surplus and social dimensions of food and agriculture	DQF

## Lecturers (or other contributors)

DQF= Dorian Q Fuller

LM= Louise Martin

PG Teaching Assistant: Anna Den Hollander (anna.hollander.18@ucl.ac.uk)

## Weekly Module Plan

The module is taught through lectures and discussions. In many sessions the first hour will be lecture and the second hour discussion. Students will be required to undertake set readings, complete pre-class activities and make (non-examined) short presentations of case study material in order to be able to actively participate in the discussion.

## STUDENT WORKLOAD DISTRIBUTION ~ 150 HRS

Nature of the Work	Hours
Lectures	10
Private reading	60-70
Seminars/ problem classes / tutorials	10
Required written work (e.g. essays/reports)	60-70

## 2. ASSESSMENT

**The use of software to generate content is not allowed for assessments for this course and will be penalised; the use of software for language and writing review and improvement is permitted, and the software and the way it has been used must be indicated in the relevant boxes on the coursework coversheet. UCL defines language and writing review as checking "areas of academic writing such as structure, fluency, presentation, grammar, spelling, punctuation, and language translation".**

**Assignment 1** (40% Of Course Mark): This assignment is a comparison of the subsistence practices of two small-scale societies from comparable environments.

It is in two parts: the first being a 10-15 min PowerPoint presentation, to be presented in class on *Week 7, Weds 15 Nov. 2023*), and the second part is a two-page written summary of the powerpoint presentation, ***due on Tuesday 21 Nov***).

*Only the second part (the written summary) of Assignment 1 is assessed for a mark. Note: The paper will be (first) marked and returned to students before the end of Term 1 so students can benefit from instructors feed-back before writing their second assignment (due in early Term 2).*

### Assignment 1 Research Aims:

Each student is to examine the similarities and differences in the annual, seasonal, and regular food procurement routines of two small-scale societies from comparable but separate environments, to identify each groups' resource selection preferences, land-use and ecological interactions with their environments. Archaeological and/or ethnographic or ethnohistoric sources can be used. Students are to focus on what is **common** to both groups and what is **unique** to each, and consider potential explanations for these similarities and differences.

**ASSIGNMENT 1 TOPICS: Students should choose from the list below and email their choice to the course instructor:**

1. Comparison of subsistence systems of hunter-gatherers-fishers from temperate southeast Australia (e.g. the Mara) with a Neolithic group (or groups) of your choosing from Atlantic Europe: (examining similarities and differences in their terrestrial as well as aquatic resource exploitation practices.)
2. Comparison of the plant exploitation systems of the Baka forest Hunter-gatherers of Southern Cameroon, particularly their uses of yams, with the Enset-farming complex in southwest Ethiopia.
3. Comparison of Sami Reindeer-herding systems in Arctic and hunting-based system of the Inuit of the West-Central Canadian Arctic, focusing on animal resources.
4. Comparison of Sami Reindeer-herding systems with Canadian Plateau Hunter-gatherer Fisher systems focusing on plant uses, particularly trees.
5. Comparison of Mississippi Valley hunter-gatherer subsistence system with that of early Lower Yangtze wet rice farming systems. Consider how the river, and flooding, affected these subsistence systems.
6. A comparison of late Jomon hunter-gatherer-fisher economies with Northwest Coast subsistence practices. Consider how fishing, plant selection, resource management (e.g. tending, protection) and storage practices influenced mobility/sedentism.
7. Analysing human resource exploitation practices of groups living on islands with a Mediterranean climate: evaluate the similarities and differences in subsistence practices of California island hunter-gatherer-fishers and prehistoric Balearic island agriculturalists.

#### **ASSIGNMENT 1, PART 1: GUIDELINES FOR POWERPOINT PRESENTATION**

to be delivered in class Week 7 - **15 Nov. 2023.** (*Note: if the class has eight or more participants, students may be asked to work in pairs for the presentation.*):

1. Use 10-15 PowerPoint slides *maximum*, not including references cited. (A separate slide for references cited should be shown at the end.)
2. Keep to the 10-15 minute time frame.
3. The Introduction should explain the geographic locations of the two groups under study and the relevance for the comparison in terms of the environments in which they live, and a general explanation of their socio-economic structures.
4. The body of the presentation should present and examine the major resources exploited by each of the groups in your study, including how they obtain those resources, species choice, resource focus (e.g. as staple, supplementary or occasional foods), and harvesting, collecting, hunting, and/or herding and culling practices. Students are encouraged to consider factors such as dietary diversity, forms of human-plant interactions, associated skills and knowledge, environmental management practices, labour organization, windows of resource availability, seasonal scheduling.
5. Students are encouraged to use charts and tables, preferably of their own making, to summarise the information, and to draw on a range of sources, which should be listed at the end of the PowerPoint. Tables and figures that are taken from other sources are also acceptable, and should be appropriately referenced on the slide and in the list of References Cited.

6. **Citations and References Cited:** At least 12 sources, at least 50% from the student's own research and up to 50% can be drawn from reading lists provided in the course handbook. Please carefully follow the guidelines for Harvard Referencing Style.
7. While it is only the written (second) part of this assignment that is assessed for a mark, students should aim for a high quality PowerPoint presentation so that the organization and content of the presentation can contribute to shaping the written work; tables and figures from these may also be used in the final paper.
8. A print-out or email copy of the PowerPoint should be submitted to the course instructor on or before the day class in Week 6.

### **ASSIGNMENT 1, PART 2: - GUIDELINES FOR WRITTEN PAPER, *Tuesday 21 November February***

2 pages of text (i.e. two sides of an A4, max 1000 words) with 1.5 spacing. Please attach to this a printout of your Powerpoint slides from Part 1 (i.e. as two slide per page); this serves as illustration to go with your 1000 words.

1. Summarise the differences between the two small scale societies that you have studied and consider possible explanations for these differences.
2. Figures and Tables and References Cited should be included but on a separate page (are not counted as part of the two page word limit).
3. Again, carefully follow the Harvard Referencing Style as consistent, appropriate referencing is assessed in all written work for this course.
4. This part of the assignment is to be produced by each student individually, even if the presentation was presented in pairs of students.
5. First marking of Assignment 1, Part 2 will be done before the end of Term 1 so students can apply the instructors feed-back to improving their second assignment (due in early Term 2).

#### **Expected Learning Outcome of Assignment 1:**

- A Deeper and More Nuanced Understanding of The Diversity in Resource Exploitation Practices, Land Uses, and Ecological and Technological Expertise and Knowledge of Societies that are (Broadly) Classified Under Broad Titles such as "Hunter-Gatherer", "Farmer" and "Pastoralist";
- Enriched skills in reasoning and Critical Assessment of Multiple Sources;
- Enriched skills in Research Use of Library/ Archival facilities;
- Experience in the Production of Presentation Graphics at a Professional level;
- Experience in the Oral Presentation of Original Research Results;
- Time Limited Assessment, permitting use of sources, testing the employment of information learned in class, as well as appropriate choice of sources, and application of independent research skills.

***If students are unclear about the nature of an assignment, they should discuss this with the Module Co-ordinator.***

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**Assignment 2 Essay (60% of mark). 2000 words. Due: 9 Januar 2024 (Thursday)**

Students should regard this as an opportunity to present a high caliber review with an original synthesis and/or ideas. Students should aim to draw on ca. 15 cited sources or more, moving beyond what is provided in the course reading lists to explore the topic with library and journal resources available at UCL. *Readings in this hand-out and discussed in seminars provide only a starting point.*

**Assignment 2 Essay Topics. Please select a topic from the list below and email your choice to your instructor before the end of Term I:**

1. Discuss the role of cultural niche construction in the changing human strategies for animal and plant exploitation evident at the terminal Pleistocene and/or early Holocene, in a region of your choice. Provide up to 3 case studies.
2. “A Calorie is Not Necessarily a Calorie” Consider the dietary, ecological, economic and social implications of advances in food processing, food preservation and storage for prehistoric human societies, providing archaeological examples.
3. What contributions can the study of plant remains, animal bones and geoarchaeology make to understanding the rise of complex societies? Provide at least 3 case studies.
4. Evaluate the evidence for the initial spread of crops and livestock into a region of your choice.
5. Compare and contrast approaches to investigating agricultural “intensification” highlighting the contribution of evidence from animals, plants and/or sediments. Outline avenues for further research.
6. Consider how social class or gender divisions of labour and/or food consumption can be inferred from archaeobotanical and/or zooarchaeological evidence from hunter-gatherer or early farming sites. Provide at least 3 case studies.
7. Consider the traditional ecological, biological and technological skills and expertise that are necessary for the accumulation, preservation and storage of food for future use; examine in detail how these activities are linked to resource selection, labour organisation, land-use, seasonality and seasonal scheduling. Discuss at least three case studies, which should include at least one hunter-gatherer and one farmer society.
8. A topic of your own choosing, which must be approved by the course co-ordinator

### **3. RESOURCES AND PREPARATION FOR CLASS**

#### **Preparation for class**

You are expected to read the **one/two/three Essential Readings** each week. Completing the readings is essential for your effective participation in the activities and discussions that we will do, and it will greatly enhance your understanding of the material covered. In addition each student will be assigned something from the further readings list that they are expected to read and summarize in discussion. We ask that you write a brief abstract (~250 words) or

set of bullet points about the paper and share this via the Moodle student café, that way you can share information about further readings. **Further readings are provided via the Online Reading List** for you to get a sense of the range of current work on a given topic and for you to draw upon for your assessments. The online reading list is accessible through the Moodle page of the module, or directly here.

### **Recommended basic texts**

Albarella, Umberto, Mauro Rizzetto, Hannah Russ, Kim Vickers, and Sarah Viner-Daniels (eds) 2017. *The Oxford Handbook of Zooarchaeology*. Oxford University Press.

Cummings, Vicki, Peter Jordan, and Marek Zvelebil (eds.) 2014 *The Oxford Handbook of the Archaeology and Anthropology of Hunter-Gatherers*. Oxford University Press.

Denham, T., Iriarte, J. & Vrydaghs, L. (Eds.) 2008. *Rethinking Agriculture. Archaeological and Ethnoarchaeological Perspectives*. Left Coast Press, Walnut Creek

Denham, T. and White, P. (Eds.) 2007 *The Emergence of Agriculture. A Global View*. Routledge

Hastorf, C.A., 2016. *The social archaeology of food: Thinking about eating from prehistory to the present*. Cambridge University Press.

Jones, Martin 2007. *Feast. Why Humans Share Food*. Oxford University Press.

Lee-Thorpe, Julie and M. Anne Katzenberg (eds.) 2016 *The Oxford Handbook of the Archaeology of Diet*. Oxford University Press

Twiss, Katheryn C. 2019. *The Archaeology of Food*. Cambridge University Press.

## **SYLLABUS**

### **Week 1. HUNTER-GATHERER-FISHERS: FORGARERS OR COLLECTORS ?**

In this session we examine the contributions of environmental archaeology to studies of hunter-gatherers, and especially the plant subsistence of hunter-gatherers. We discuss several models that classify hunter-gatherer groups by their subsistence practices. Some scholars have drawn a distinction between foraging versus collecting economies: what is the significance of this distinction and how to address it through archaeological evidence. In addition we consider the expectations and critique of the “broad spectrum revolution” as applied to wild plant economies. What is optimal foraging theory and the “diet breadth model”? Case studies will be drawn from Palaeolithic and early Holocene contexts.

#### **Key topics to consider:**

- How does mobility influence site-location and settlement patterns?
- How does seasonality of resources influence site-location (e.g. “
- Degree of specialisation on resources
- Degree of specialisation of types of sites
- Degrees of interaction/interdependence between communities

#### **Questions to ask of site data include:**

- Is the site permanently or temporarily (possibly seasonally?) occupied?
- Is it a single occupation, or was it repeatedly occupied?
- Is there evidence for exploitation at the site of only locally available resources, or a wider range of resources?



- What part of a temporal cycle does a site represent?
- What part of the economic system does the site represent?

**Also consider different emphases of models, such as:**

- Central-place foraging models (Winterhalder 2001; Bird & Bird 1997)
- gender-based differences (Hawkes 1996)
- role of juvenile foragers (Bird & Bird 2000; Hawkes et al. 1995; Bock 2007; Tucker and Young 2007)
- diet-breadth models (Kelly 1995; Stiner & Munro 2002)
- patch-choice models (Kelly 1995; Winterhalder 2001)
- Evolutionary aspects of hunter-gatherer behavioural ecology (Hawkes et al. 1997)
- Niche construction (Rowley-Conwy and Layton 2011, Smith 2011)
- Resilience theory (Rosen and Rivera-Collazo 2012. )

**ESSENTIAL READINGS:**

Rowley-Conwy, P. and Piper, S., 2016. Hunter-Gatherer Variability. *Arctic*, 69, pp.1-14.

Smith B. D. 2011 General patterns of niche construction and the management of 'wild' plant and animal resources by small-scale pre-industrial societies. *Phil. Trans. R. Soc. B* 366, 836–84

Wollstonecroft, M.M., 2011. Investigating the role of food processing in human evolution: a niche construction approach. *Archaeological and Anthropological Sciences*, 3(1), pp.141-150.

Florin, S.A., Fairbairn, A.S., Nango, M., Djandjomerr, D., Marwick, B., Fullagar, R., Smith, M., Wallis, L.A. and Clarkson, C., 2020. The first Australian plant foods at Madjedbebe, 65,000–53,000 years ago. *Nature communications*, 11(1), pp.1-8.

**RECOMMENDED ADDITIONAL READING**

\*Graeber, David and David Wengrow 2021. *The Dawn of Everything. A New History of Humanity*. London: Allen Lane. Pp. 98-119

**FURTHER READINGS:**

books

Hather, J.G. and Mason, S.L.R. (Eds.) 2002. *Hunter-Gatherer Archaeobotany: Perspectives from the northern temperate zone*. UCL Institute of Archaeology, London.

Hardy, K. and Martens, L.K., 2016. *Wild harvest: Plants in the hominin and pre-agrarian human worlds*. Oxbow books.

Kelly, Robert L. 2013. *The Lifeways of Hunter-Gatherers. The Foraging Spectrum*. Cambridge: Cambridge University Press

articles

Wengrow, D. and Graeber, D., 2018. "Many seasons ago": slavery and its rejection among foragers on the Pacific coast of North America. *American Anthropologist*, 120(2), pp.237-249.

Thompson, J.C., Wright, D.K. and Ivory, S.J., 2021. The emergence and intensification of early hunter-gatherer niche construction. *Evolutionary Anthropology: Issues, News, and Reviews*, 30(1), pp.17-27.

Carrión Marco, Morales, et al. (2018) "The Use of Wild Plants in the Palaeolithic and Neolithic of Northwestern Africa: Preliminary Results from the PALEOPLANT Project," in *Plants and People in the African Past* (A. Mercuri et al., eds.)

- Crittenden, A.N. and Schnorr, S.L., 2017. Current views on hunter-gatherer nutrition and the evolution of the human diet. *American Journal of Physical Anthropology*, 162, pp.84-109.
- Dilkes-Hall, I.E., O'Connor, S. and Balme, J., 2019. People-plant interaction and economic botany over 47,000 years of occupation at Carpenter's Gap 1, south central Kimberley. *Australian Archaeology*, 85(1), pp.30-47.
- Guan, Y., Pearsall, D. M., Gao, X., Chen, F., Pei, S., & Zhou, Z. (2014). Plant use activities during the upper Paleolithic in east Eurasia: evidence from the Shuidonggou site, Northwest China. *Quaternary International*, 347, 74-83
- Kelly, R.L. 1995. *The Foraging Spectrum: Diversity in Hunter-gatherer Lifeways*. Smithsonian Institution Press: Washington, D.C.
- Kubiak-Martens, L. 2002 New evidence for the use of root foods in pre-agrarian subsistence recovered from the late Mesolithic site of Halsskov, Denmark. *Vegetation History and Archaeobotany* 11, 23 – 32.
- Liu, L., Bestel, S., Shi, J., Song, Y. and Chen, X., 2013. Paleolithic human exploitation of plant foods during the last glacial maximum in North China. *Proceedings of the National Academy of Sciences*, 110(14), 5380-5385.
- Martínez-Varea, C. M., Ferrer-Gallego, P. P., Raigón, M. D., Badal, E., Ferrando-Pardo, I., Laguna, E., ... & Villaverde, V. (2019). Corema album archaeobotanical remains in western Mediterranean basin. Assessing fruit consumption during Upper Palaeolithic in Cova de les Cendres (Alicante, Spain). *Quaternary Science Reviews*, 207, 1-12
- Morales, et al. (2015) "First Preliminary Evidence for Basketry and Nut Consumption in the Capsian Culture (ca. 10,000–7500 BP): Archaeobotanical Data from New Excavations at El Mekta, Tunisia," *Journal of Anthropological Archaeology* 37 (2015): 128–139
- Ramsey, M.N. and Rosen, A.M., 2016. Wedded to wetlands: Exploring Late Pleistocene plant-use in the Eastern Levant. *Quaternary International*, 396, pp.5-19.
- Roberts, P. and Petraglia, M., 2015. Pleistocene rainforests: barriers or attractive environments for early human foragers?. *World Archaeology*, 47(5), pp.718-739.
- Riede F. 2011 Adaptation and niche construction in human prehistory: a case study from the southern Scandinavian Late Glacial. *Phil. Trans. R. Soc. B* 366, 793–808. doi:10.1098/rstb.2010.0266
- Sievers, C., 2006. Seeds from the middle stone age layers at Sibudu Cave. *Southern African Humanities*, 18(1), pp.203-222.
- Tucker, B. and Young, A. 2007. Growing up Mikea: Children's Time Allocation and Tuber Foraging in Southwestern Madagascar. In Hewlett, B.S. and Lamb, M.E. (Eds.) *Hunter-Gatherer Childhoods: Evolutionary, Developmental and Cultural Perspectives*, pp 147-174. Transaction Publishers, New Brunswick, New Jersey.
- Weiss, E., Wetterstrom W., Nadel D , Bar-Yosef O . 2004. The broad spectrum revisited: evidence from plant remains , PNAS 101, 9551 -9555.
- 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.
- Wollstonecroft M, Ellis PR, Hillman GC, Fuller D.Q. 2008. "Advancements in plant food processing in the Near Eastern Epipalaeolithic and implications for improved edibility and nutrient bioaccessibility: an experimental assessment of sea club-rush (*Bolboschoenus maritimus* (L.) Palla)". *Vegetation History and Archaeobotany* 17 (Suppl. 1), S19-S27.

*On Gender and hunter-gatherer subsistence practices*

“Archaeologists who assume a rigid division of labor characterizes all modern human societies risk projecting their Western beliefs onto the archaeological record” (Kent 1998:39).

Kent, Susan 1998 Invisible Gender—Invisible Foragers: Southern African Hunter-Gatherer Spatial Patterning and the Archaeological Record. *In* Gender in African Prehistory. Susan Kent, ed. Pp. 39–67. Walnut Creek, CA: AltaMira Press.

Hunn, E.S., 1981. On the relative contribution of men and women to subsistence among hunter-gatherers of the Columbia Plateau: a comparison with Ethnographic Atlas summaries. *J. Ethnobiology* 1, 124-134.

Speth, J.D. 1990. Seasonality, resource stress, and food sharing in so-called “egalitarian” foraging societies. *J. Anthropological Archaeology* 9, 148-188.

## **WEEK 2. Hunting strategies, broad spectrum adaptations**

This session will explore variation in hunting strategies, including distinctions between big-game and smaller, harder to catch small game, a distinction often attributed to a broad spectrum revolution. The impact of domesticated dogs is also considered. Faunal evidence relating to seasonality, the use of dental microware, isotopes

### **Readings**

Rowley-Conway, P. and Layton, R. 2011. Foraging and farming as niche construction: stable and unstable adaptations. *Philosophical Transactions of the Royal Society B* 366, 849-862.

Stiner, M.C., N.D. Munro and T.A. Surovell. 2000. The tortoise and the hare: small-game use, the broad-spectrum revolution, and Palaeolithic demography. *Current Anthropology* 41, 39-73.

Zeder, M.A., 2012. The broad spectrum revolution at 40: resource diversity, intensification, and an alternative to optimal foraging explanations. *Journal of Anthropological Archaeology*, 31(3), pp.241-264.

Yeomans, L., Martin, L. and Richter, T., 2019. Close companions: Early evidence for dogs in northeast Jordan and the potential impact of new hunting methods. *Journal of Anthropological Archaeology*, 53, pp.161-173.

### **Further Readings**

Bird, D.W., Bliege Bird, R. and Codding, B.F., 2016. Pyrodiversity and the anthropocene: The role of fire in the broad spectrum revolution. *Evolutionary Anthropology: Issues, News, and Reviews*, 25(3), pp.105-116.

Edwards, P.C., 1989. Revising the Broad Spectrum Revolution: and its role in the origins of Southwest Asian food production. *Antiquity*, 63(239), pp.225-246.

Henton, E., Martin, L., Garrard, A., Jourdan, A.L., Thirlwall, M. and Boles, O., 2017. Gazelle seasonal mobility in the Jordanian steppe: the use of dental isotopes and microwear as

environmental markers, applied to Epipalaeolithic Kharaneh IV. *Journal of Archaeological Science: Reports*, 11, pp.147-158.

Martin, L., Edwards, Y. and Garrard, A., 2013. Broad spectrum or specialised activity? Birds and tortoises at the Epipalaeolithic site of Wadi Jilat 22 in the eastern Jordan steppe. *Antiquity*, 87(337), pp.649-665.

Morgan, C., 2015. Is it intensification yet? Current archaeological perspectives on the evolution of hunter-gatherer economies. *Journal of Archaeological Research*, 23(2), pp.163-213.

Stutz, A.J., Munro, N.D. and Bar-Oz, G., 2009. Increasing the resolution of the Broad Spectrum Revolution in the Southern Levantine Epipaleolithic (19–12 ka). *Journal of Human Evolution*, 56(3), pp.294-306.

### Hunting and “broad spectrum” in the tropics

Lupo, K.D. and Schmitt, D.N., 2002. Upper Paleolithic net-hunting, small prey exploitation, and women's work effort: a view from the ethnographic and ethnoarchaeological record of the Congo Basin. *Journal of Archaeological Method and Theory*, 9(2), pp.147-179.

Gaffney, D., Summerhayes, G.R., Luu, S., Menzies, J., Douglass, K., Spitzer, M. and Bulmer, S., 2021. Small game hunting in montane rainforests: Specialised capture and broad spectrum foraging in the Late Pleistocene to Holocene New Guinea Highlands. *Quaternary Science Reviews*, 253, p.106742.

Perera, N., Kourampas, N., Simpson, I.A., Deraniyagala, S.U., Bulbeck, D., Kamminga, J., Perera, J., Fuller, D.Q., Szabó, K. and Oliveira, N.V., 2011. People of the ancient rainforest: Late Pleistocene foragers at the Batadomba-lena rockshelter, Sri Lanka. *Journal of human evolution*, 61(3), pp.254-269.

## **WEEK 3. PLANT DOMESTICATION, AGRICULTURAL ORIGINS, and INTERMEDIATE ECONOMIES with a focus on the Grain Domestication in the Near East**

In this session we examine general principles involved in the study of agricultural origins, including defining domestication of plants, cultivation and agriculture, and the evidence for studying these in the Near East. We explore the issues surrounding a slow transition and intermediate economies. **CONSIDER:** What are the meanings of the terms: “*Plant Management*”, “*Cultivation*”, “*Domestication*” and “*Agriculture*”? We return to discussion of these terms again in Week 4 (with regard to animals) and in Week 5 (with regard to non-cereal crops).

### **ESSENTIAL READINGS**

Harris, David R. and D. Q. Fuller (2014) Agriculture: Definition and Overview. In *Encyclopedia of Global Archaeology* (Claire Smith, Ed.). Springer, New York. pp 104-113

Fuller, D. Q., Denham, T., Kistler, L., Stevens, C., Larson, G., Bogaard, A., & Allaby, R. (2022). Progress in domestication research: Explaining expanded empirical observations. *Quaternary Science Reviews*, 296, 107737.

Allaby, Robin G., Chris J. Stevens, Logan Kistler and Dorian Q Fuller (2022) The emerging evidence for plant domestication as a landscape level process. *Trends in Evolution and Ecology* 37(3): 268-279 <https://doi.org/10.1016/j.tree.2021.11.002>

Weide, A., 2021. Towards a Socio-Economic Model for Southwest Asian Cereal Domestication. *Agronomy*, 11(12), p.2432.

### **RECOMMENDED ADDITIONAL READING**

\*Graeber, David and David Wengrow 2021. *The Dawn of Everything. A New History of Humanity*. London: Allen Lane. Pp. 225-248

### **FURTHER READING**

Arranz-Otaegui, A., Carretero, L.G., Roe, J. and Richter, T., 2018. "Founder crops" v. wild plants: assessing the plant-based diet of the last hunter-gatherers in southwest Asia. *Quaternary Science Reviews*, 186, pp.263-283.

Asouti, E. and Fuller, D.Q. 2013. A Contextual Approach to the Emergence of Agriculture in Southwest Asia: Reconstructing Early Neolithic Plant-Food Production. *Current Anthropology* 2013 54: 299-345

Fuller, D Q., T. Denham, M Arroyo-Kalin, L. Lucas, C.J. Stevens, L. Qin, R.G. Allaby and M. D. Prugganan. 2014. Convergent evolution and parallelism in plant domestication revealed by and expanding archaeological record. *PNAS* 111, 6147-6152.

Fuller, Dorian Q, Leilani Lucas, Lara Gonzalez Carretero, and Chris Stevens (2018) From intermediate economies to agriculture: trends in wild food use, domestication and cultivation among early villages in southwest Asia. *Paleorient* 44(2): 59-74

Fuller, D. Q., Denham, T., & Allaby, R. (2023). Plant domestication and agricultural ecologies. *Current Biology*, 33(11), R636-R649.

Bogaard, A., Allaby, R., Arbuckle, B.S., Bendrey, R., Crowley, S., Cucchi, T., Denham, T., Frantz, L., Fuller, D., Gilbert, T. and Karlsson, E., 2021. Reconsidering domestication from a process archaeology perspective. *World Archaeology*, pp.1-22.

Colledge, S. and Conolly, J. 2010. Reassessing the evidence for the cultivation of wild crops during the Younger Dryas at Tell Abu Hureyra, Syria. *Environmental Archaeology* 15, 124-138.

Harlan, J.R. 1967. A wild wheat harvest in Turkey. *Archaeology* 20, 197 – 201.

Hillman, G. C. and Davies, M. S. 1990. Measured domestication rates in wild wheats and barley under primitive cultivation, and their archaeological implications. *J. World Prehistory* 4, 157–222.

Kislev, M., E. Weiss and A. Hartmann. (2004). Impetus for sowing and the beginnings of agriculture: ground collecting of wild cereals. *PNAS* 101, 2692-2695.

Maeda, O., Lucas, L., Silva, F., Tanno, K. I., & Fuller, D. Q. (2016). Narrowing the harvest: Increasing sickle investment and the rise of domesticated cereal agriculture in the Fertile Crescent. *Quaternary Science Reviews* 145: 226-237

Roberts, N., Woodbridge, J., Bevan, A., Palmisano, A., Shennan, S. and Asouti, E., 2018. Human responses and non-responses to climatic variations during the last Glacial-Interglacial transition in the eastern Mediterranean. *Quaternary Science Reviews*, 184, pp.47-67.

Snir A, Nadel D, Groman-Yaroslavski I, Melamed Y, Sternberg M, Bar-Yosef, O. and Weiss, E. . 2015. The Origin of Cultivation and Proto-Weeds, Long Before Neolithic Farming. *PLOS ONE* 10(7): e0131422. <https://doi.org/10.1371/journal.pone.0131422>

Tanno, K. and Willcox, G. 2006. How Fast Was Wild Wheat Domesticated? *Science* 311, 1886.

Weide, A., Hodgson, J.G., Leschner, H., Dovrat, G., Whitlam, J., Manela, N., Melamed, Y., Osem, Y. and Bogaard, A., 2021. The association of arable weeds with modern wild cereal habitats: Implications for reconstructing the origins of plant cultivation in the Levant. *Environmental Archaeology*, pp.1-16.

Weide A, Riehl S, Zeidi M, Conard NJ (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): e0189811. <https://doi.org/10.1371/journal.pone.0189811>

Willcox, G., Buxo, R. and Herveux, L. 2009. Late Pleistocene and early Holocene climate and the beginnings of cultivation in northern Syria. *The Holocene* 19, 151-158.

#### **WEEK 4. Animal Domestication**

This session will focus in more detail on the zooarchaeological evidence for animal domestication and inferences of how early herds were managed. It also touches on the issue of initial herd dispersals, such as from southwest Asia to Cyprus, and later dispersal towards Europe.

#### **ESSENTIAL READINGS**

Larson, G., & Fuller, D. Q. (2014). The evolution of animal domestication. *Annual Review of Ecology, Evolution, and Systematics*, 45, 115-136.

Arbuckle, B.S. and Kassebaum, T.M., 2021. Management and domestication of cattle (*Bos taurus*) in Neolithic Southwest Asia. *Animal Frontiers*, 11(3), pp.10-19.

Vigne, J.D., Carrere, I., Briois, F. and Guilaine, J., 2011. The early process of mammal domestication in the Near East: New evidence from the Pre-Neolithic and Pre-Pottery Neolithic in Cyprus. *Current Anthropology*, 52(S4), pp.S255-S271.

Price, M. and Hongo, H., 2020. The archaeology of pig domestication in Eurasia. *Journal of Archaeological Research*, 28(4), pp.557-615.

#### **FURTHER READINGS**

Axelsson, E. Axelsson<sup>1</sup>, Ratnakumar, A., Arendt, M-L., Maqbool, K., Webster, M.T., Perloski, M., Liberg, O., Arnemo, J.M., Hedhammar, A. & Lindblad-Toh<sup>1</sup>, K. 2013. The genomic signature of dog domestication reveals adaptation to a starch-rich diet. *Nature* 495, 360-364.

Bogaard, A., Allaby, R., Arbuckle, B.S., Bendrey, R., Crowley, S., Cucchi, T., Denham, T., Frantz, L., Fuller, D., Gilbert, T. and Karlsson, E., 2021. Reconsidering domestication from a process archaeology perspective. *World Archaeology*, pp.1-22.

Craig, O. E. et al. 2005. 'Did the first farmers of central and eastern Europe produce dairy foods?' *Antiquity* 79, 882–894

Curry, Andrew 2013 Archaeology: The milk revolution, *Nature* 500, 20-22. <http://www.nature.com/news/archaeology-the-milk-revolution-1.13471>

Evershed. R.P. et al. 2008. Earliest date for milk use in the Near East and southeastern Europe linked to cattle herding. *Nature* 455, 528-531..

Harris, D.R. 2002. Development of agro-pastoral economy in the Fertile Crescent during the Pre-Pottery Neolithic period. In Cappers, R. and Bottema, S. (Eds), *The Transition from Foraging to Farming in Southwest Asia*, Berlin: Ex Oriente. [Teaching collection 2130]

Helmer, D.L., Gourichon, L., Monchot, H., Peters, J. and Segui, M.S. 2005. Identifying early domestic cattle from pre-pottery Neolithic sites on the Middle Euphrates using sexual dimorphism. In Vigne, J.-D., Peters, J., and Helmer, D. (Eds.), *The First Steps of Animal Domestication*, pp 86-95. Oxbow Books, Oxford.

Henton, E., Meier-augensten, H. and Kemp, H. F. 2010. The use of oxygen isotopes in sheep molars to investigate past herding practices at the Neolithic settlement of Catalhöyük, central Anatolia. *Archaeometry*, 52 issue 3.

Peters, Joris, Ophélie Lebrasseur, Evan Irving-Pease. Ptolemaios Dimitrios Paxinos, Julia Best, Riley Smallman, Cécile Callou, Armelle Gardeisen, Simon Trix, Laurent Frantz, Naomi Sykes, Dorian Fuller and Gregor Larson (2022) The biocultural origins and dispersal of domestic chickens. *Proceedings of the National Academy of Sciences (USA)*. 119 (24) e2121978119 DOI: 10.1073/pnas.2121978119 [published online 6 June 2022]

Mason, I. L. (Ed.) 1984. *Evolution of Domesticated Animals*. Longman Scientific, London. [INST ARCH HA MAS]

Vigne, J.-D., Carrere, I., Saliege, J.-F., Person, A., Bocherens, H., Guilaine, J. and Briois, J.-F. 2000. Predomestic cattle, sheep, goat and pig during the late 9<sup>th</sup> and the 8<sup>th</sup> millennium cal. BC on Cyprus: preliminary results of Shillourokambos (Parekklisha, Limassol). In Mashkour, M., Choyke, A., Buitenhuis, H. and Poplin, F. (Eds.), *Archaeozoology of the Near East IVA*, 83-106. ARC Publicatie 32, Groningen. [Teaching collection 2427; INST ARCH DBA 4 BUI]

Hongo, H., Meadow, R. H., Oksuz, B. and Ilgezdi, G. 2005. Sheep and Goat Remains from Çayönü Tepesi, Southeastern Anatolia. In Buitenhuis, H., Choyke, A., Martin, L., Bartosiewicz, L. and Mashkour, M. (Eds.), *Archaeozoology of the Near East VI. Proceedings of the sixth international symposium on the archaeozoology of southwestern Asia and adjacent areas*, 113-24. ARC-Publicatie, Groningen.

Hongo, H., Pearson, J., Oksuz, B., Ilgezdi, G. 2009. The Process of Ungulate Domestication at Çayönü, Southeastern Turkey: A Multidisciplinary Approach focusing on *Bos* sp. And *Cervus elaphus*. *Anthropozoologica*, 44, 63-78.

Peters, J., von den Driesch, A., Helmer, D. 2005. The upper Euphrates Tigris Basin: cradle of agro-pastoralism? In *The First Steps of Animal Domestication*, Vigne, J.-D., Peters, J. and Helmer, D. (Eds) pp 96-123. Oxford: Oxbow Books.

Zeder, M. A., & Lemoine, X. (2022). A Journey Begins with a Single Step: How Early Holocene Humans and Wild Boar (*Sus scrofa*) Embarked on the Pathway to Domestication in the Eastern Fertile Crescent. *Journal of Archaeological Method and Theory*, 1-69.

## **WEEK 5. Alternative pathways to agriculture: vegeculture, arboriculture, lowland and highland tropics**

In this session we move beyond the “standard” model of cereal domestication and agricultural origins derived from the Near East, and consider some alternative pathways, especially involving tuber and tree domestication such as in the highlands of New Guinea, and the Neotropical lowland forest regions. Again we must consider the role and longevity of intermediate economies.

### **ESSENTIAL READINGS**

Barton, H. and Denham, T., 2018. Vegecultures and the social–biological transformations of plants and people. *Quaternary International*, 489, pp.17-25.

Fuller, Dorian Q and Tim Denham (2022) Coevolution in the arable battlefield: pathways to crop domestication, cultural practices and parasitic domesticoids. In: T. Schulz, Peter N. Peregrine, and Richard Gawne (eds) *The Convergent Evolution of Agriculture in Humans and Insects*, 38th KLI Altenberg Workshop, Vienna Series in Theoretical Biology. MIT Press. Pp. 175-208 [PDF to be provided via moodle]

Denham, T. and Donohue, M., 2022. Mapping the middle ground between foragers and farmers. *Journal of Anthropological Archaeology*, 65, p.101390.

Clement, C.R., Casas, A., Parra-Rondinel, F.A., Levis, C., Peroni, N., Hanazaki, N., Cortés-Zárraga, L., Rangel-Landa, S., Alves, R.P., Ferreira, M.J. and Cassino, M.F., 2021. Disentangling domestication from food production systems in the neotropics. *Quaternary*, 4(1), p.4.

### **RECOMMENDED ADDITIONAL READING**

\*Graeber, David and David Wengrow 2021. *The Dawn of Everything. A New History of Humanity*. London: Allen Lane. Pp. 249-275

Fuller, D. Q., Denham, T., & Allaby, R. (2023). Plant domestication and agricultural ecologies. *Current Biology*, 33(11), R636-R649.

### **FURTHER READINGS**

Barron, A., Fuller, D.Q., Stevens, C., Champion, L., Winchell, F. and Denham, T., 2020. Snapshots in time: MicroCT scanning of pottery sherds determines early domestication of sorghum (*Sorghum bicolor*) in East Africa. *Journal of Archaeological Science*, 123, p.105259.

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.

Denham, T. P., S. G. Haberle, C. Lentfer, R. Fullagar, J. Field, et al. 2003. "Origins of Agriculture at Kuk Swamp in the Highlands of New Guinea." *Science* 301:189– 193.

Florin, S.A. and Carah, X., 2018. Moving past the 'Neolithic problem': The development and interaction of subsistence systems across northern Sahul. *Quaternary International*, 489, pp.46-62.

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

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.

Fuller, Dorian Q, Louis Champion, and Chris Stevens (2019) Comparing the tempo of cereal dispersal and the agricultural transition: two African and one West Asian trajectory. In: *Trees, Grasses and Crops – People and Plants in sub-Saharan Africa and Beyond*. (eds. Barbara Einhorn and Alexa Höhn). *Frankfurter Archäologischen Schriften* 37. Bonn: Verlag Dr. Rudolf Habelt GmbH. Pp. 119-140

Harris, D.R., 1977. Alternative pathways toward agriculture (pp. 179-244). In: C. Reed (ed) *Origins of Agriculture*. De Gruyter Mouton.



Hildebrand, E.A., 2003. Motives and opportunities for domestication: an ethnoarchaeological study in southwest Ethiopia. *Journal of anthropological archaeology*, 22(4), pp.358-375.

Logan, A.L. and D'Andrea, A.C., 2012. Oil palm, arboriculture, and changing subsistence practices during Kintampo times (3600–3200 BP, Ghana). *Quaternary International*, 249, pp.63-71.

Oliver, J.R., 2008. The archaeology of agriculture in ancient Amazonia. In *The handbook of South American archaeology* (pp. 185-216). Springer, New York, NY.

Perrier, X., De Langhe, E., Donohue, M., Lentfer, C., Vrydaghs, L., Bakry, F., Carreel, F., Hippolyte, I., Horry, J.P., Jenny, C. and Lebot, V., 2011. Multidisciplinary perspectives on banana (*Musa spp.*) domestication. *Proceedings of the National Academy of Sciences*, 108(28), pp.11311-11318.

Piperno, D.R., 2011. The origins of plant cultivation and domestication in the New World tropics: patterns, process, and new developments. *Current anthropology*, 52(S4), pp.S453-S470.

## **WEEK 6. READING WEAK [no class]**

**WEEK 7. Student powerpoint presentations (based on assignment 1).** This will be chaired by Anna den Hollander

Each student will present for at least 10 minutes (max 15) based on preparations for Assignment 1. Discussion in class will revolve around these.

## **WEEK 8. Genetics, ancient DNA and its contribution to studying, domestication, agricultural transformations and migrations**

This session will provide an introduction to some of the implications of the genomics and ancient DNA revolution for archaeology and especially environmental archaeology, including domestication and agricultural dispersal..

### **Basic premises:**

A) Some genomes are simply inherited maternally intact (mitochondria, plant chloroplast), or father to son (Y-chromosome). The rest of the genome (most of it) recombines and mixes up 50% from each parent. (But in self-pollinating plants the mother and father may be the same!)

B) Genetics does not provide as straight forward answers about prehistory as you might expect! It finds patterns of relationship but there may be more than one historical process to explain those relationships. Analyses either focus on shared ancestry (phylogeny and/or coalescence) or hybridization (network models, structure, principle components) an the reality is likely some combination of the two.

Genetic changes: mutations, drift that removes or shift frequency if variants and relates to population size and time, selection that removes or increases variants as adaptation, some changes may piggy back selection).

C) Most genetics papers tell just-so stories, but really you should be looking for strong inference from multiple working hypothesis and some sort of model testing for the best fitting hypothesis (story testing not story testing: see below)

The reading list below develops some themes and approaches to analysing genetic data for archaeological, population history questions through sets of case studies (under suggested readings)

### Essential Readings

Kristiansen, K., Allentoft, M. E., Frei, K. M., Iversen, R., Johannsen, N. N., Kroonen, G., ... & Sikora, M. (2017). Re-theorising mobility and the formation of culture and language among the Corded Ware Culture in Europe. *Antiquity*, 91(356), 334-347

MacHugh, D.E., Larson, G. and Orlando, L., 2017. Taming the past: ancient DNA and the study of animal domestication. *Annual Review of Animal Biosciences*, 5, pp.329-351.

Gerbault, P., Allaby, R. G., Boivin, N., Rudzinski, A., Grimaldi, I. M., Pires, J. C., ... & Arroyo-Kalin, M. (2014). Storytelling and story testing in domestication. *Proceedings of the National Academy of Sciences*, 201400425.

Brunson, K. and Reich, D., 2019. The promise of paleogenomics beyond our own species. *Trends in Genetics*, 35(5), pp.319-329.

### Further Readings

In an ideal world, think about working through the list below in order. Otherwise choose one of these pairs or trios of papers to read and consider.

1-3 [Pigs in Europe vs. Pigs in Asia] then compare to dogs in Europe (#3)

3-5 The origins and adaptations of dogs

6-9. Cattle origins, twice or more? How to take into account introgression?

10-12 Barley origins

13+14 Emmer wheat origins

15-17 Rice origins

18-20 Maize

21-23 Functional genomics—identifying domestication traits

Phylogeny, phylogeography: examples from animals and plants

Look how the European pig story becomes more complicated with ancient DNA. This shows how the history recorded in genetic evidence may be incomplete due to poor sampling. Sampling is needed not just across space but across time, to account for lineage extinction/extirpation.

1) Larson, G., Albarella, U., Dobney, K., Rowley-Conwy, P., Schibler, J., Tresset, A., ... & Bălăşescu, A. (2007). Ancient DNA, pig domestication, and the spread of the Neolithic into Europe. *Proceedings of the National Academy of Sciences*, 104(39), 15276-15281.

Now consider how the situation in China and SE Asia contrasts with that of Europe, thus implying very different systems of pig management and domestication processes over the long-term. The phylogenetic patterns on regional wild and domesticated populations are different in different reasons, we need to explain this in terms of different traditional management practices.

2) Larson G., Liu R, Zhao X, Yuan J, Fuller DQ, Barton L, Dobney K, Fan Q, Gu Z, Liu X-H, Luo Y, Lv P, Andersson L, Li N. Patterns of East Asian pig domestication, migration and turnover revealed by modern and ancient DNA. *Proc Natl Acad Sci USA*. 2010; 107(17): 7686-7691

### Dogs

3) Ollivier, M., Tresset, A., Frantz, L. A., Bréhard, S., Bălăşescu, A., Mashkour, M., ... & Bartosiewicz, L. (2018). Dogs accompanied humans during the Neolithic expansion into Europe. *Biology letters*, 14(10), 20180286.

4) Frantz, et al. (2016) "Genomic and archaeological evidence suggest a dual origin of domestic dogs." *Science* 352: 1228-1231.

5) Bergström, A., Frantz, L., Schmidt, R., Ersmark, E., Lebrasseur, O., Girdland-Flink, L., ... & Skoglund, P. (2020). Origins and genetic legacy of prehistoric dogs. *Science*, 370(6516), 557-564.

Cattle origins: how many domestications? How large a population? Where have all the wild cattle gone.

6) Bradley, D. G., Loftus, R. T., Cunningham, P., & MacHugh, D. E. (1998). Genetics and domestic cattle origins. *Evolutionary Anthropology: Issues, News, and Reviews: Issues, News, and Reviews*, 6(3), 79-86.

7) Chen, S., Lin, B. Z., Baig, M., Mitra, B., Lopes, R. J., Santos, A. M., ... & Beja-Pereira, A. (2010). Zebu cattle are an exclusive legacy of the South Asia Neolithic. *Molecular biology and evolution*, 27(1), 1-6.

8) Bollongino, R., Burger, J., Powell, A., Mashkour, M., Vigne, J. D., & Thomas, M. G. (2012). Modern taurine cattle descended from small number of near-eastern founders. *Molecular biology and evolution*, 29(9), 2101-2104.

9) Chen, N., Cai, Y., Chen, Q., Li, R., Wang, K., Huang, Y., ... & Lei, C. (2018). Whole-genome resequencing reveals world-wide ancestry and adaptive introgression events of domesticated cattle in East Asia. *Nature Communications*, 9(1), 1-13.

What about plant domestication? Barley should be a straight forward self-pollinating case (outcrossing is estimated to be ~2%). Selected data from across the genome data again indicates phylogeographic patterns that separate east and west which is supported by a "structure analysis" of admixture (e.g. Saisho & Purugganan 2007). More recent genomic level data highlight how important admixture (hybridization) was in the origins of barley.

10) Saisho, D., & Purugganan, M. (2007). Molecular phylogeography of domesticated barley traces expansion of agriculture in the Old World. *Genetics* 177: 1765–1776

11). Allaby, R. G. (2015). Barley domestication: the end of a central dogma?. *Genome Biology*, 16(1), 1-3.

#### A contribution from ancient DNA

12) Mascher, M., Schuenemann, V. J., Davidovich, U., Marom, N., Himmelbach, A., Hübner, S., ... & Stein, N. (2016). Genomic analysis of 6,000-year-old cultivated grain illuminates the domestication history of barley. *Nature Genetics*, 48(9), 1089-1093.

#### Emmer Wheat

13) Scott, M. F., Botigué, L. R., Brace, S., Stevens, C. J., Mullin, V. E., Stevenson, A., ... & Mott, R. (2019). A 3,000-year-old Egyptian emmer wheat genome reveals dispersal and domestication history. *Nature plants*, 5(11), 1120-1128.

14) Iob, A., & Botigué, L. (2022). Genomic analysis of emmer wheat shows a complex history with two distinct domestic groups and evidence of differential hybridization with wild emmer from the western Fertile Crescent. *Vegetation History and Archaeobotany*, 1-14.

Now consider rice origins: single origin or more? What is the genetic picture? What about maternal versus nuclear markers, whole chromosomes versus whole genomes? What role for hybridization?

15) Molina J, Sikora M, Garud N, Flowers JM, Rubinstein S, Reynolds A, et al. Molecular evidence for a single evolutionary origin of domesticated rice. *PNAS*. 2011a;108:8351–6.

16) Choi, Jae Young, Adrian E. Platts, Dorian Q Fuller, Yue-le Hsing, Rod A. Wing, and Michael D. Purugganan (2017) The rice paradox: Multiple origins but single domestication in Asian rice. *Molecular Biology and Evolution* 34 (4): 969-979. DOI: 10.1093/molbev/msx049

17) Gutaker, R. M., Groen, S. C., Bellis, E. S., Choi, J. Y., Pires, I. S., Bocinsky, R. K., ... & Purugganan, M. D. (2020). Genomic history and ecology of the geographic spread of rice. *Nature plants*, 6(5), 492-502.

#### Maize

18) Vallebuena-Estrada, M., Rodríguez-Arévalo, I., Rougon-Cardoso, A., Martínez González, J., García Cook, A., Montiel, R., & Vielle-Calzada, J. P. (2016). The earliest maize from San Marcos Tehuacán is a partial domesticate with genomic evidence of inbreeding. *Proceedings of the National Academy of Sciences*, 113(49), 14151-14156.

19) Kistler, L., Maezumi, S. Y., Gregorio de Souza, J., Przelomska, N. A., Malaquias Costa, F., Smith, O., ... & Allaby, R. G. (2018). Multiproxy evidence highlights a complex evolutionary legacy of maize in South America. *Science*, 362(6420), 1309-1313.

20) Kistler, L., Thakar, H. B., VanDerwarker, A. M., Domic, A., Bergström, A., George, R. J., ... & Kennett, D. J. (2020). Archaeological Central American maize genomes suggest ancient gene flow from South America. *Proceedings of the National Academy of Sciences*, 117(52), 33124-33129.

Functional genetics indicating a sequence of genetic changes with domestication: compare rice and maize

21) Ishikawa, R., Castillo, C. C., & 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), 1-14.

22) Wang, H., Nussbaum-Wagler, T., Li, B., Zhao, Q., Vigouroux, Y., Faller, M., ... & Doebley, J. F. (2005). The origin of the naked grains of maize. *Nature*, 436(7051), 714-719.

23) Jaenicke-Despres, V., Buckler, E. S., Smith, B. D., Gilbert, M. T. P., Cooper, A., Doebley, J., & Paabo, S. (2003). Early allelic selection in maize as revealed by ancient DNA. *Science*, 302(5648), 1206-1208.

## WEEK 9. Animal Secondary Products

It has long been recognized that domestication made possible a range of further exploitation strategies which gradually were adopted and developed by human societies. Termed “secondary products” by Sherratt, these activities have been searched for, initially with little success. However, in the case of dairying, the last decade has seen a series of initiatives which have led to the identification of milk residues in ceramics. Elsewhere, less work has been done on intensified agricultural production. This seminar will consider the progress that has been made so far and consider ways in which future lines of investigation may develop.

### Essential Readings

Sherratt, A., 1983. The secondary exploitation of animals in the Old World. *World archaeology*, 15(1), pp.90-104.

Marciniak, A., 2011. The secondary products revolution: Empirical evidence and its current zooarchaeological critique. *Journal of World Prehistory*, 24(2), pp.117-130.

O'Brien., M.J. & Bentley, R.A. 2015. The role of food storage in human niche construction: An example from Neolithic Europe. *Environmental Archaeology* 20, 364-378. This paper discusses developments in dairying and the evolution of lactase persistence in humans

### **Further readings**

Sherratt, A. 1981. Plough and pastoralism: aspects of the secondary products revolution, in Hodder, Isaac, G. and Hammond, N. (Eds.), *Pattern of the Past: Studies in Honour of David Clarke*, 261-305. Cambridge University Press, Cambridge. [Teaching collection 523] [also reprinted in Sherratt, Andrew. *Economy and society in prehistoric Europe: changing perspectives* [DA 100 She]

Casanova, Emmanuelle, Timothy DJ Knowles, Alex Bayliss, Mélanie Roffet-Salque, Volker Heyd, Joanna Pyzel, Erich Claßen et al. "Recent Advances in Archaeological Science Techniques Special Feature: Dating the emergence of dairying by the first farmers of Central Europe using 14C analysis of fatty acids preserved in pottery vessels." *Proceedings of the National Academy of Sciences of the United States of America* 119, no. 43 (2022).

Evershed, R.P., Davey Smith, G., Roffet-Salque, M., Timpson, A., Diekmann, Y., Lyon, M.S., Cramp, L.J., Casanova, E., Smyth, J., Whelton, H.L. and Dunne, J., 2022. Dairying, diseases and the evolution of lactase persistence in Europe. *Nature*, 608(7922), pp.336-345.

Sabatini, Serena, Sophie Bergerbrant, Luise Ø. Brandt, Anoush Margaryan, and Morten E. Allentoft. "Approaching sheep herds origins and the emergence of the wool economy in continental Europe during the Bronze Age." *Archaeological and Anthropological Sciences* 11 (2019): 4909-4925.

### **Milk and residues**

Copley, M.S., Berstan, R., Dudd, S.N., Aillaud, S., Mukherjee, A.J., Straker, V., Payne, S. and Evershed, R.P. 2005. Processing of milk products in pottery vessels through British Prehistory. *Antiquity* 79, 895-908.

Craig, O.E., Chapman, J., Heron, C., Willis, L.H., Bartosiewicz, L., Taylor, G., Whittle, A. and Collins, M. 2005. Did the first farmers of central and eastern Europe produce dairy foods? *Antiquity* 79, 882-894.

Dudd, S.N. and Evershed, R.P. 1998. Direct demonstration of milk as an element of archaeological economies. *Science* 282, 1478-1481.

Entwistle, R. and Grant, A. 1989. The evidence for cereal cultivation and animal husbandry in the southern British Neolithic and Bronze Age. In Milles, A., Williams, D. and Gardner, N. (Eds.), *The Beginnings of Agriculture*, pp 203-215. BAR International Series 496.

Greenfield, H.J., 2010. The Secondary Products Revolution: the past, the present and the future. *World Archaeology*, 42(1), pp.29-54.

Halstead, P. 1996. Pastoralism or household herding? Problems of scale and specialization in early Greek animal husbandry. *World Archaeology* 28, 20-42.

Halstead, P. 1998. Mortality models and milking: problems of uniformitarianism, optimality and equifinality reconsidered. *Anthropozoologica* 27, 3-20.

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## **WEEK 10. Agricultural Intensification and Land Use**

Long-term changes in food production are variously associated with the adoption of domesticates, technological innovation, land management, and rising demand originating from demographic pressure, trade, and/or tribute. These factors are important situationally and often interrelated, hence complex for archaeology to disentangle. In this lecture we examine current archaeological debates on agricultural strategies, intensification and links to landscape modification, highlighting the contributions of environmental archaeology to reconstructing past land use.

### **Essential readings.**

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### **Further readings**

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### Regional examples

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Kidder, T.R., Liu, H.W. and Li, M.L. 2012. Sanyangzhuang: early farming and a Han settlement preserved beneath Yellow River flood deposits. *Antiquity* 86: 30-47

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## **WEEK 11. Complex societies: Producers, Consumers, The Scale of Surplus and social dimensions of food and agriculture**

In this class we examine issues where food and food production are taken in new directions by hierarchical and complex societies, including the role of processing, storage, conspicuous consumption. In all human societies, food procurement, production and consumption are known to be culturally mediated. Increasingly, archaeologists have come to recognise that the social dimensions of subsistence and consumption have had a significant bearing on the archaeological record. The division of labour and differential access to resources, be it by gender, age, social status/rank, that have shaped human societies in the past, will likewise have shaped the form and content of archaeological sites and the distribution of sites over the landscape.



## ESSENTIAL READINGS

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## FURTHER READING

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### **Further Readings on Gender and food production:**

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Burton, M.L. and White. D.R. 1984. Sexual Division of Labor in Agriculture. *American Anthropologist*, New Series, 86, 568-583

Elizabeth M. Brumfiel 1992. Breaking and entering the ecosystem - gender, class, and faction steal the show. *American Anthropologist*, New Series, 94, 551-567