



Introduction to Plant Macrofossil Analysis

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MPI-SHH
SUMMER SCHOOL
2021

Doorway
to Human History

Here we provide a step-by-step introduction to the method from the excavation to the publication



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History



Plant Macrofossil Analysis



Step 1: Setting up your project

What are your research questions?

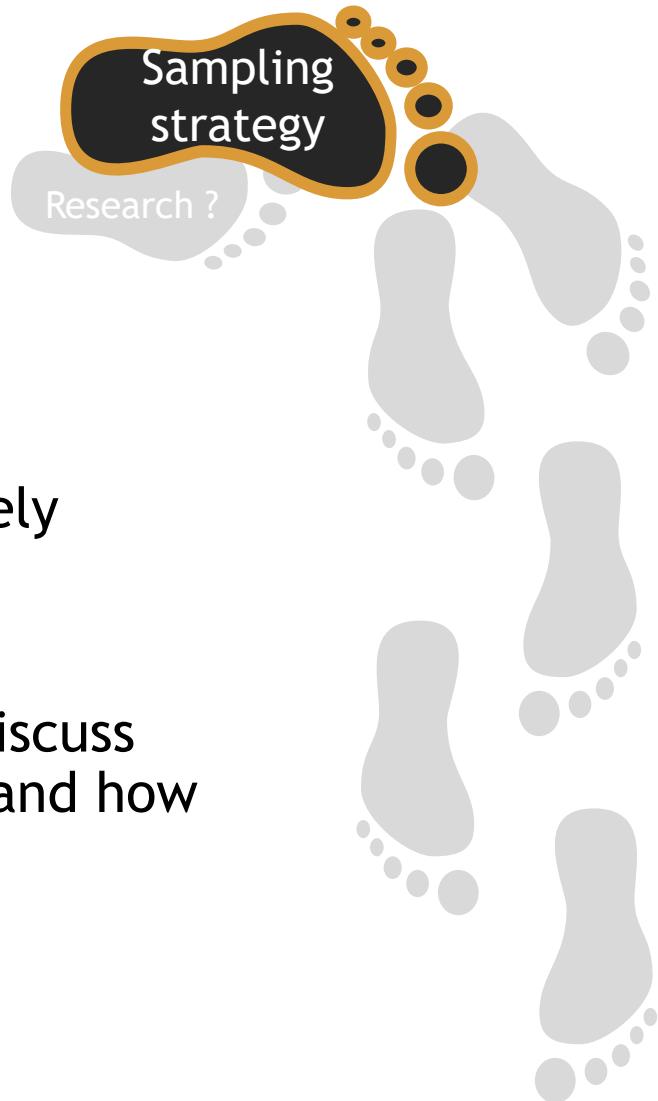
Does macrofossil analysis make sense for your research questions?



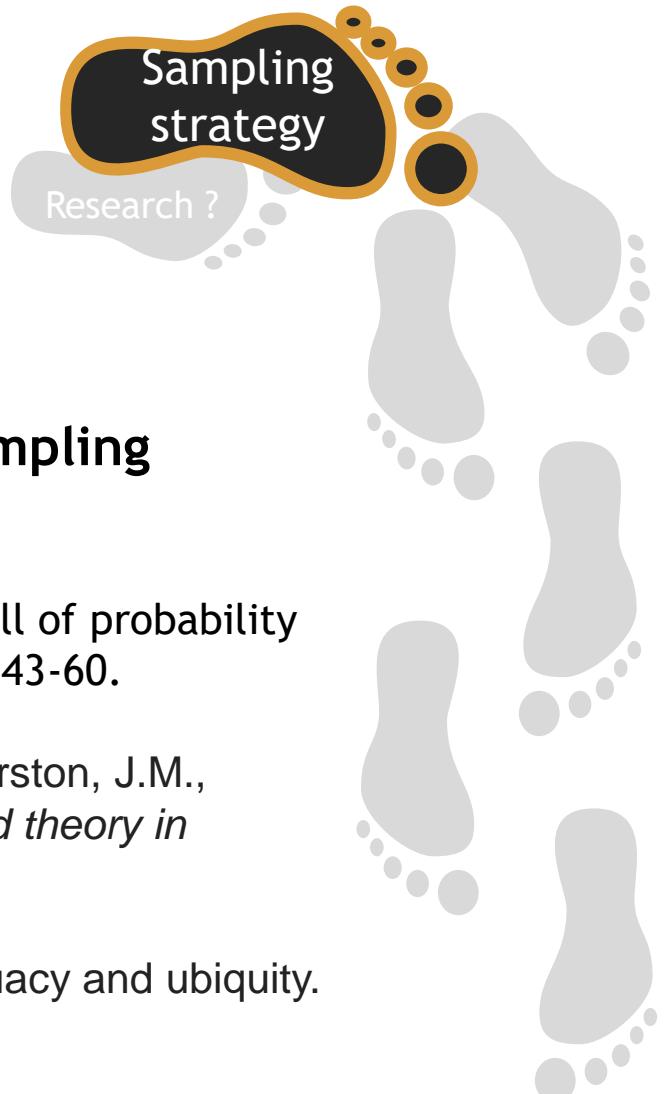
Plant Macrofossil Analysis

Step 2: Setup a Sampling Strategy

- How do you know if your samples adequately represent the site?
- Work with field director and excavators, discuss research ideas, their plan for excavation, and how your research fits.
- Careful record keeping..



Plant Macrofossil Analysis



Sampling
strategy

Research ?

Step 2: Setup a Sampling Strategy

A few helpful resources for setting up a sampling strategy:

Banning, E.B. (2021). Sampled to death? The rise and fall of probability sampling in archaeology. *American Antiquity*, 86(1), pp. 43-60.

Chapter 5 by J. d'Alpoim Guedes and R. Spengler in Marston, J.M., Guedes, J.D.A. and Warinner, C. eds., 2015. *Method and theory in paleoethnobotany*. University Press of Colorado.

Diehl, M.W. (2017). Paleoethnobotanical sampling adequacy and ubiquity. *Advances in Archaeological Practice*, 5(2), pp. 196-205.

Lennström, H.A. and Hastorf C.A. (1995). Interpretation in context: Sampling and analysis in paleoethnobotany. *American Antiquity*, 60(4), pp. 701-721.



Sampling
strategy

Research ?

Fieldwork

Plant Macrofossil Analysis

Step 3: Fieldwork

- Sampling



Sampling
strategy

Research ?

Fieldwork

Plant Macrofossil Analysis

Flotation

Machine
flotation



Bucket
flotation



Plant Macrofossil Analysis

Flotation

Aim is to separate **organic** and cultural material from **rocks** and sediment



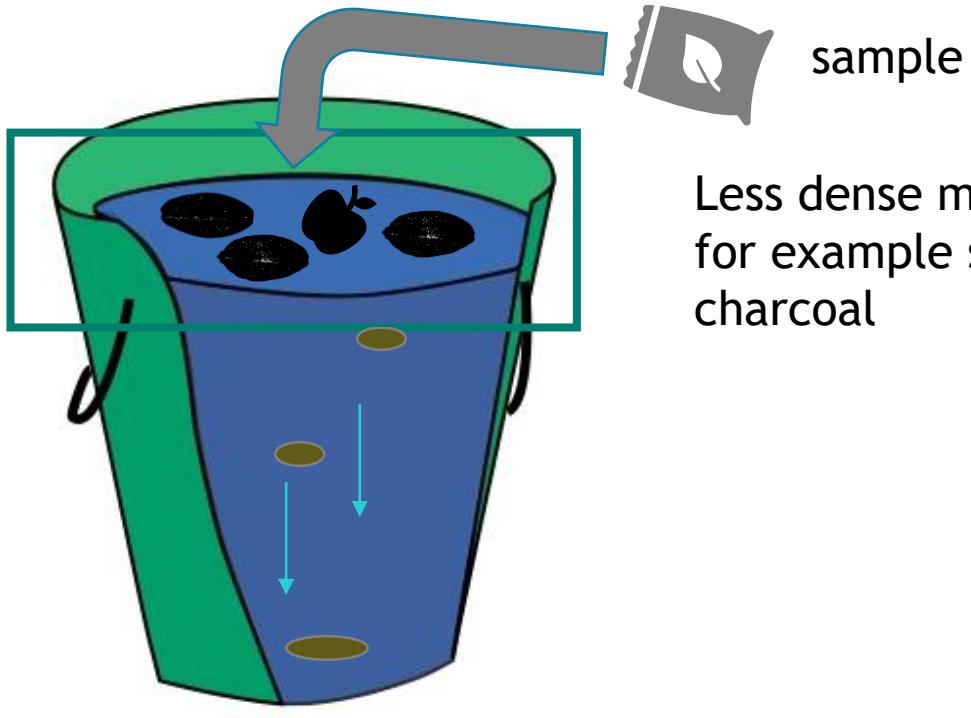
sample



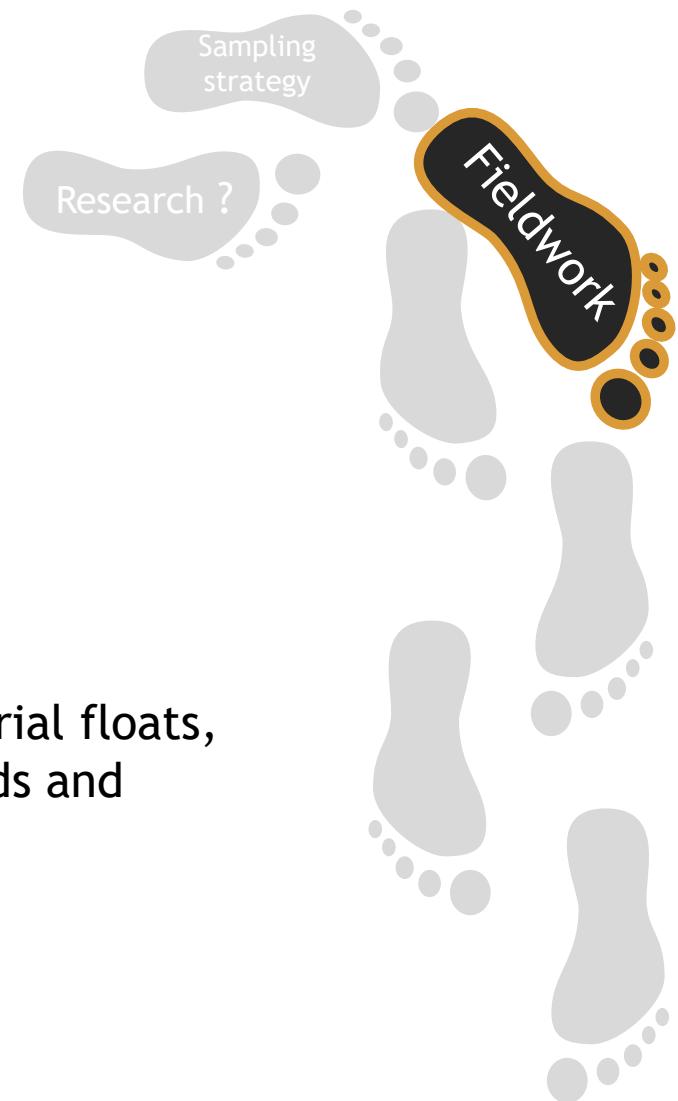
Plant Macrofossil Analysis

Flotation

Aim is to separate **organic** and cultural material from **rocks** and sediment



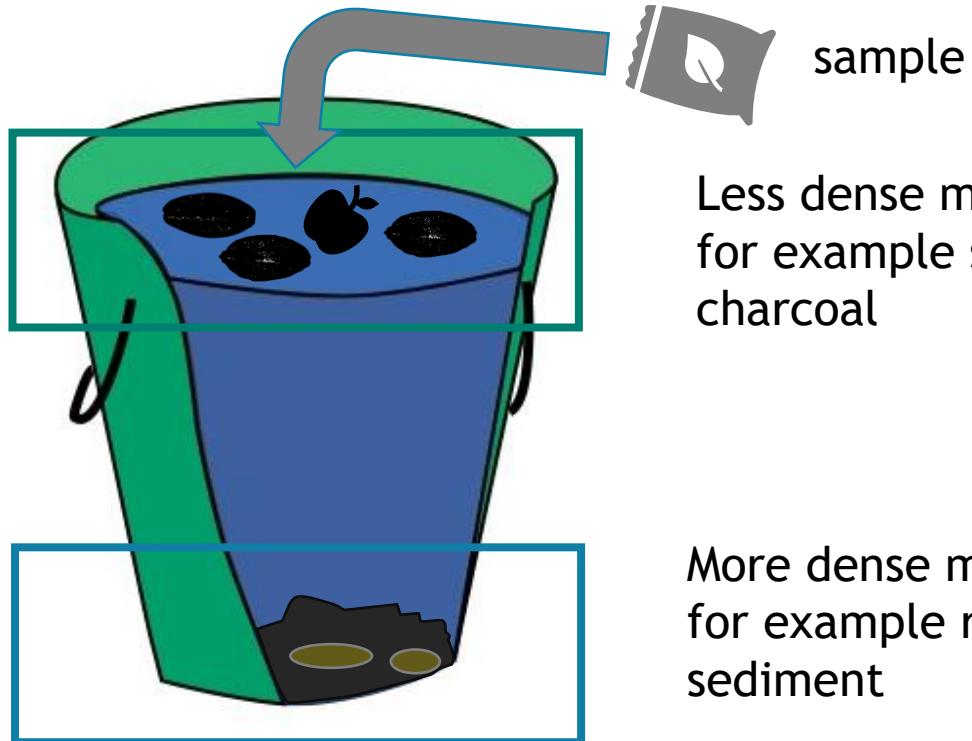
Less dense material floats,
for example seeds and
charcoal



Plant Macrofossil Analysis

Flotation

Aim is to separate **organic** and cultural material from **rocks** and sediment



Sampling
strategy

Research ?

Fieldwork



Sampling
strategy

Research ?

Fieldwork

Plant Macrofossil Analysis

Drying + Packing



Plant Macrofossil Analysis

Step 4: Processing samples

Check your research questions



Sampling
strategy

Research ?

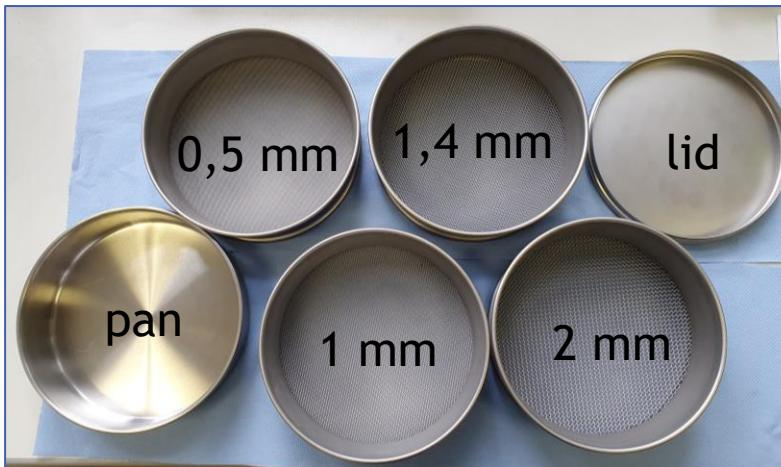
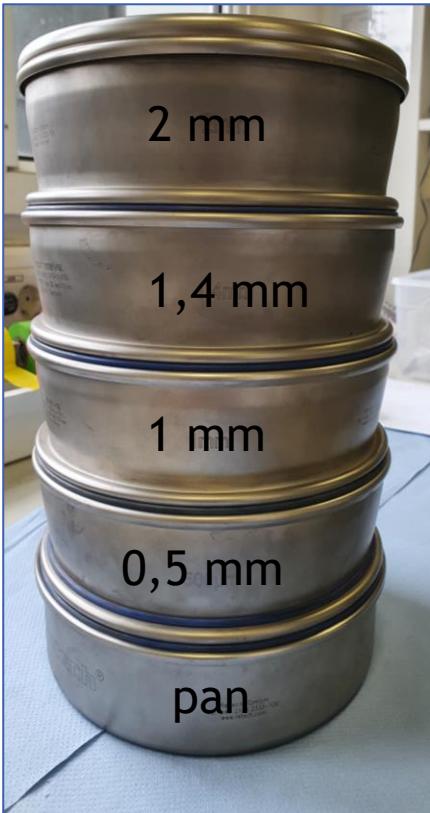
Fieldwork

Processing

Plant Macrofossil Analysis

Step 4: Processing samples

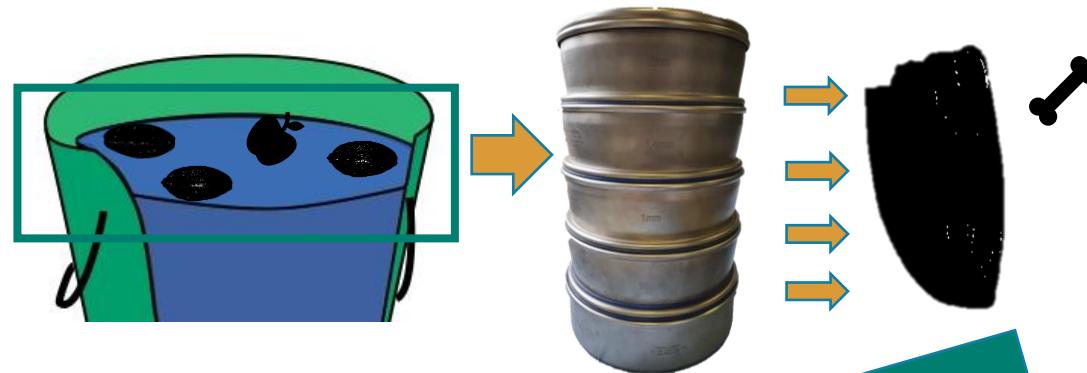
- Check your research question
- Sieving



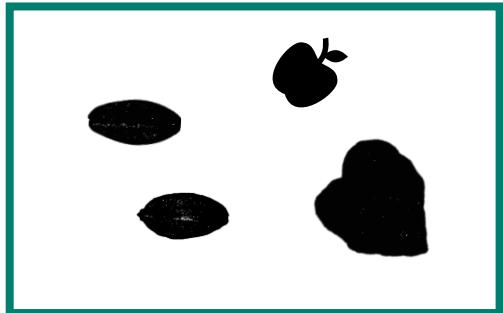
Plant Macrofossil Analysis

Step 4: Processing samples

- Check your research questions
- Sieving



Plant related material (not wood)

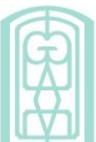


Wood



Unidentifiable material

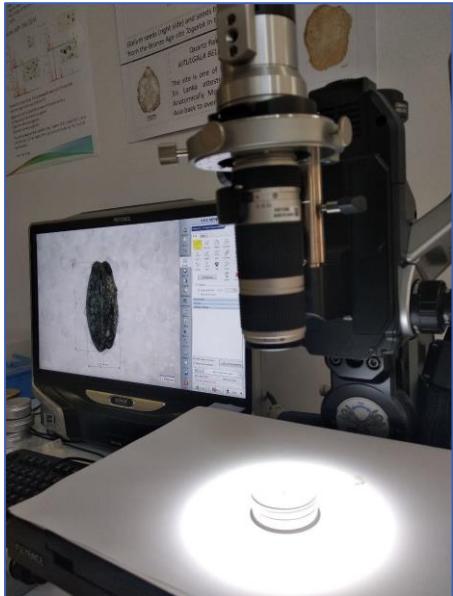
X
y
Z



Plant Macrofossil Analysis

Step 4: Processing samples

- Check your research questions
- Sieving
- Sorting material and identification



Optical Microscope

Keyence Digital
Microscope



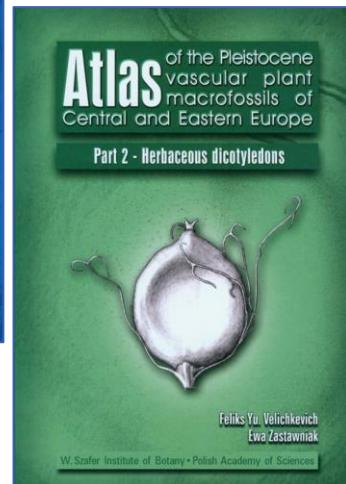
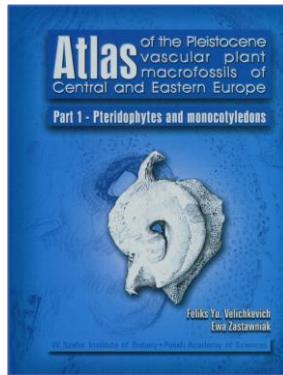
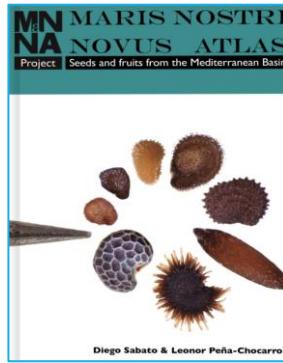
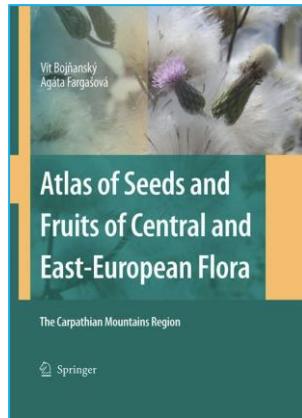
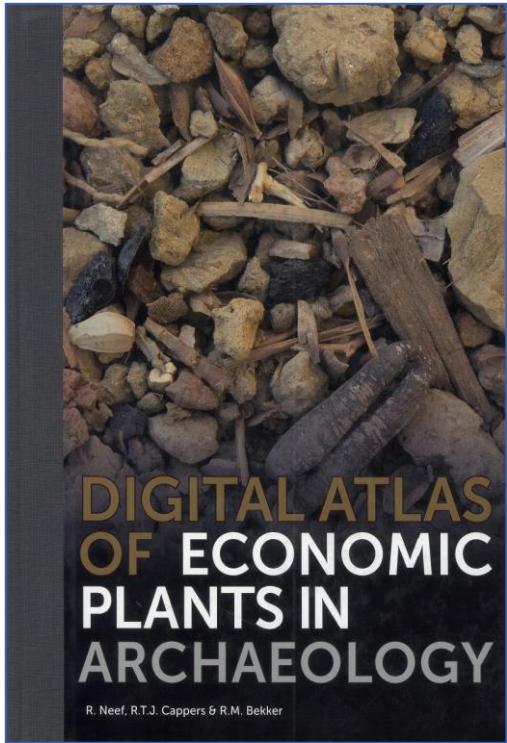
Scanning
Electron
Microscope



Plant Macrofossil Analysis

Step 4: Processing samples

- Check your research questions
- Sieving
- Sorting material and identification



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Human History

Sampling
strategy

Research ?

Fieldwork

Processing

Plant Macrofossil Analysis

Step 4: Processing samples

- Check your research questions
- Sieving
- Sorting material and identification

Comparative collections



Unripe Spelt Wheat



Khorasan Wheat



Barley



Wheat



Rye



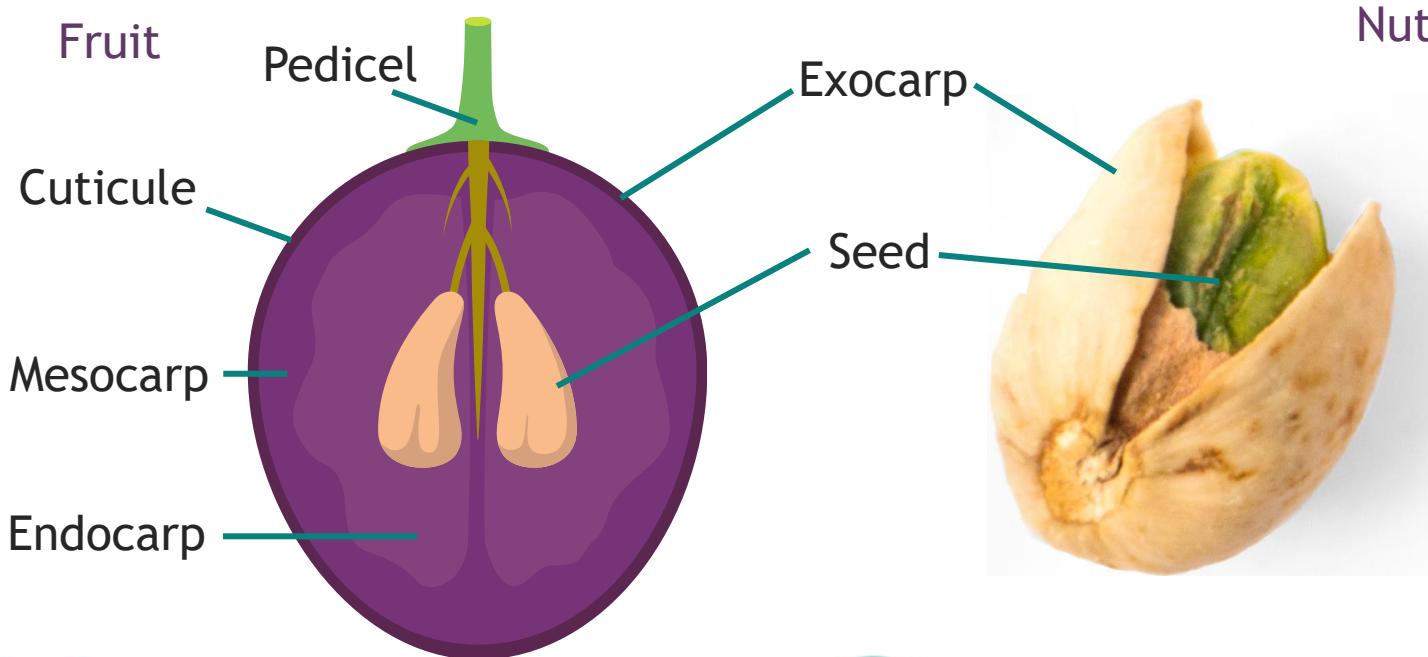
Millet



Plant Macrofossil Analysis

Step 4: Processing samples

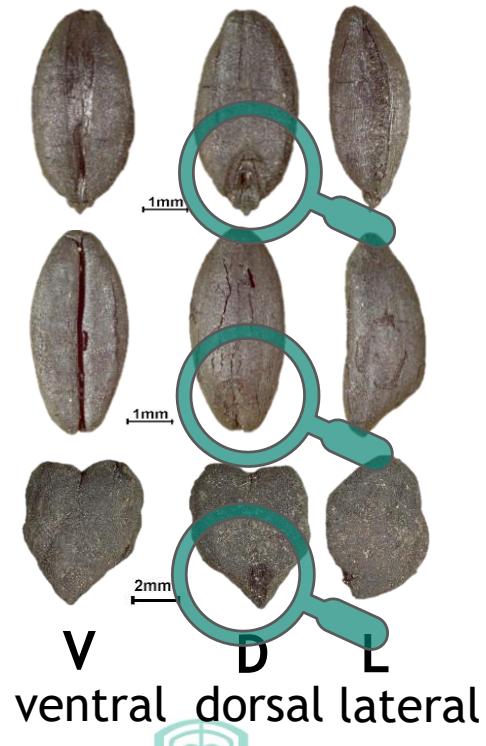
- Check your research questions
- Sieving
- Sorting material and identification



Plant Macrofossil Analysis

Step 4: Processing samples

- Check your research questions
- Sieving
- Sorting material and identification



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Sampling
strategy

Research ?

Fieldwork

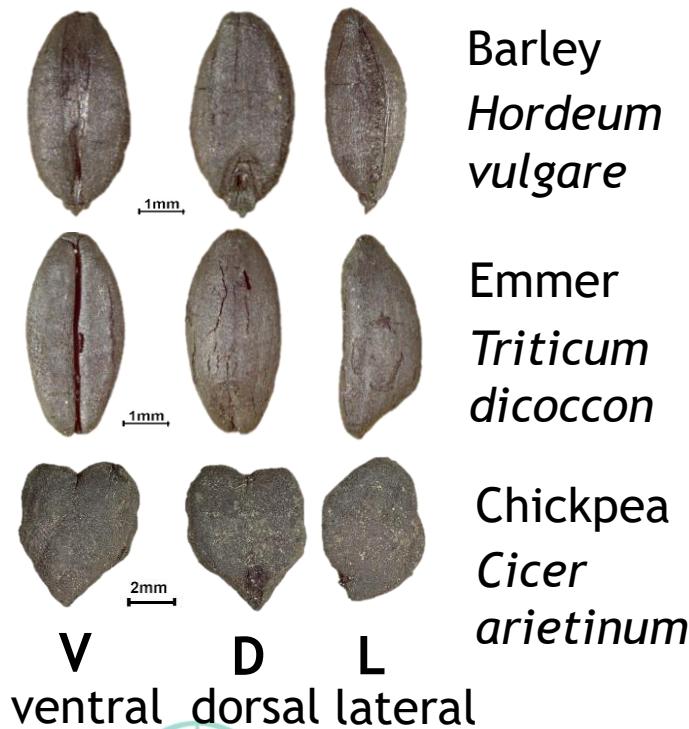
Processing



Plant Macrofossil Analysis

Step 4: Processing samples

- Check your research questions
- Sieving
- Sorting material and identification



Sampling
strategy

Research ?

Fieldwork

Processing



Plant Macrofossil Analysis

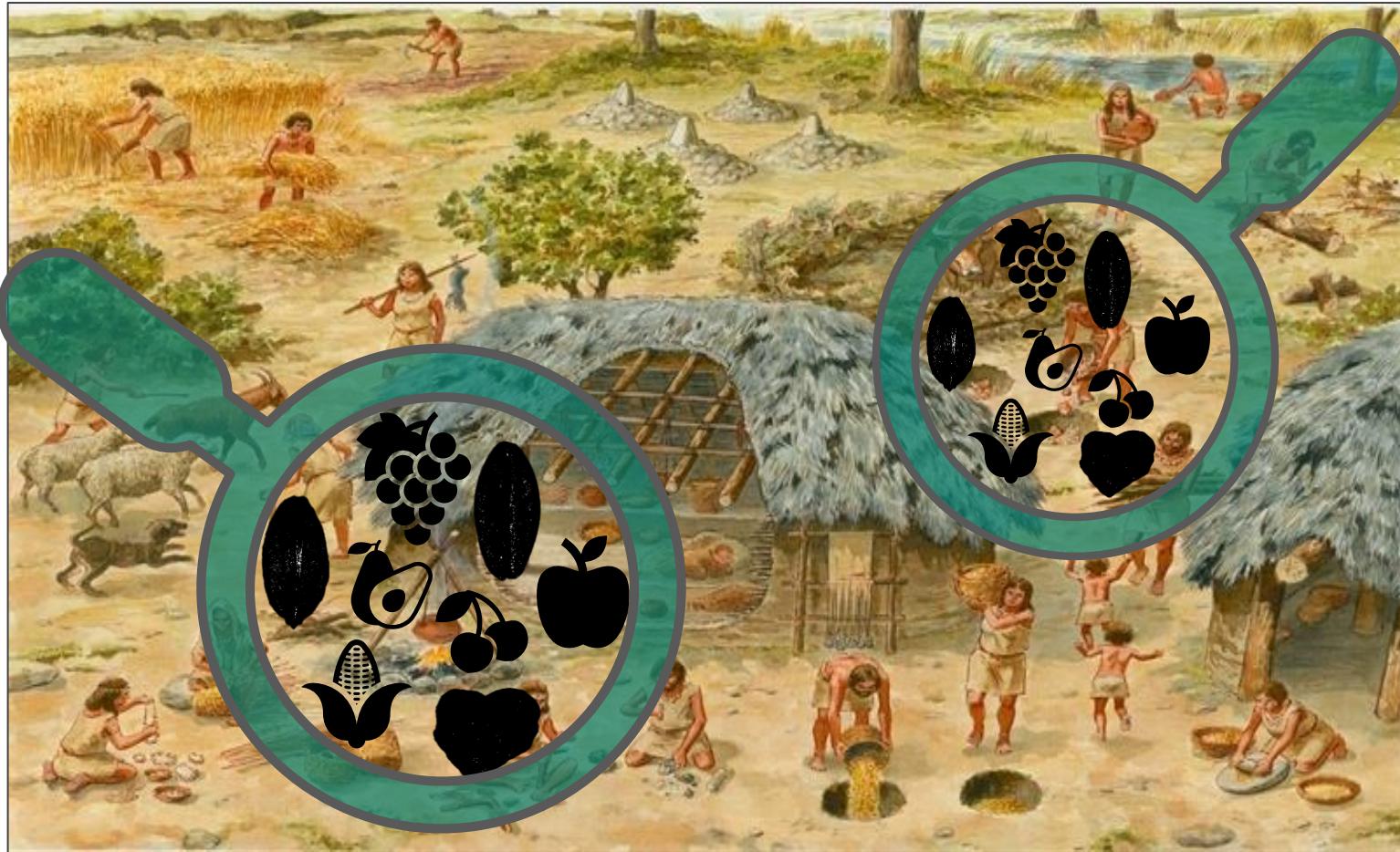
Step 4: Processing samples

- Check your research questions
- Sieving
- Sorting material
- **Storing and documentation**



Plant Macrofossil Analysis

Step 5: Analyzing material



Sampling
strategy

Research ?

Fieldwork

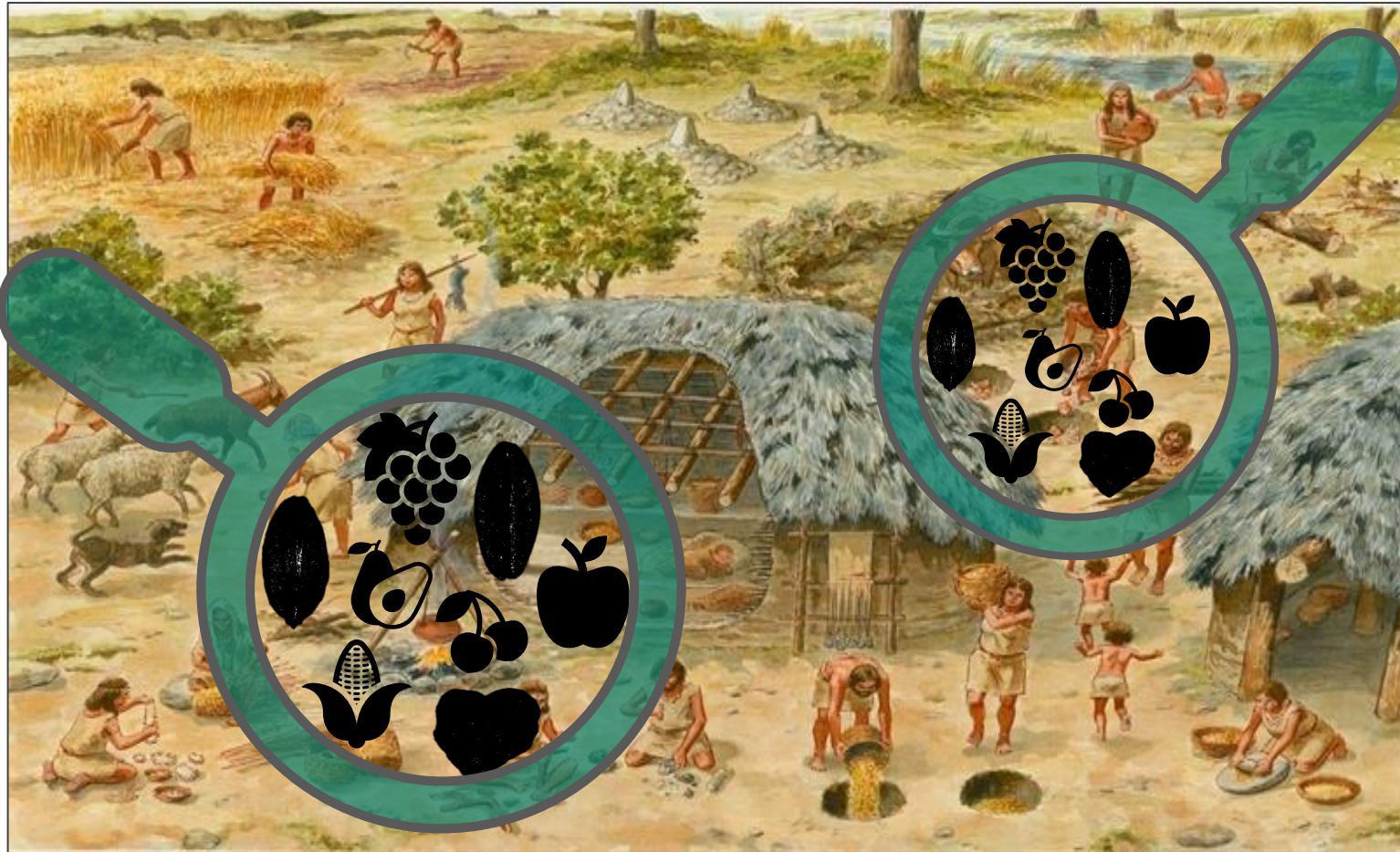
Processing

Analyzing



Plant Macrofossil Analysis

The presence and absence data or ubiquity



www.tinmeoarts.com

Sampling
strategy

Research ?

Fieldwork

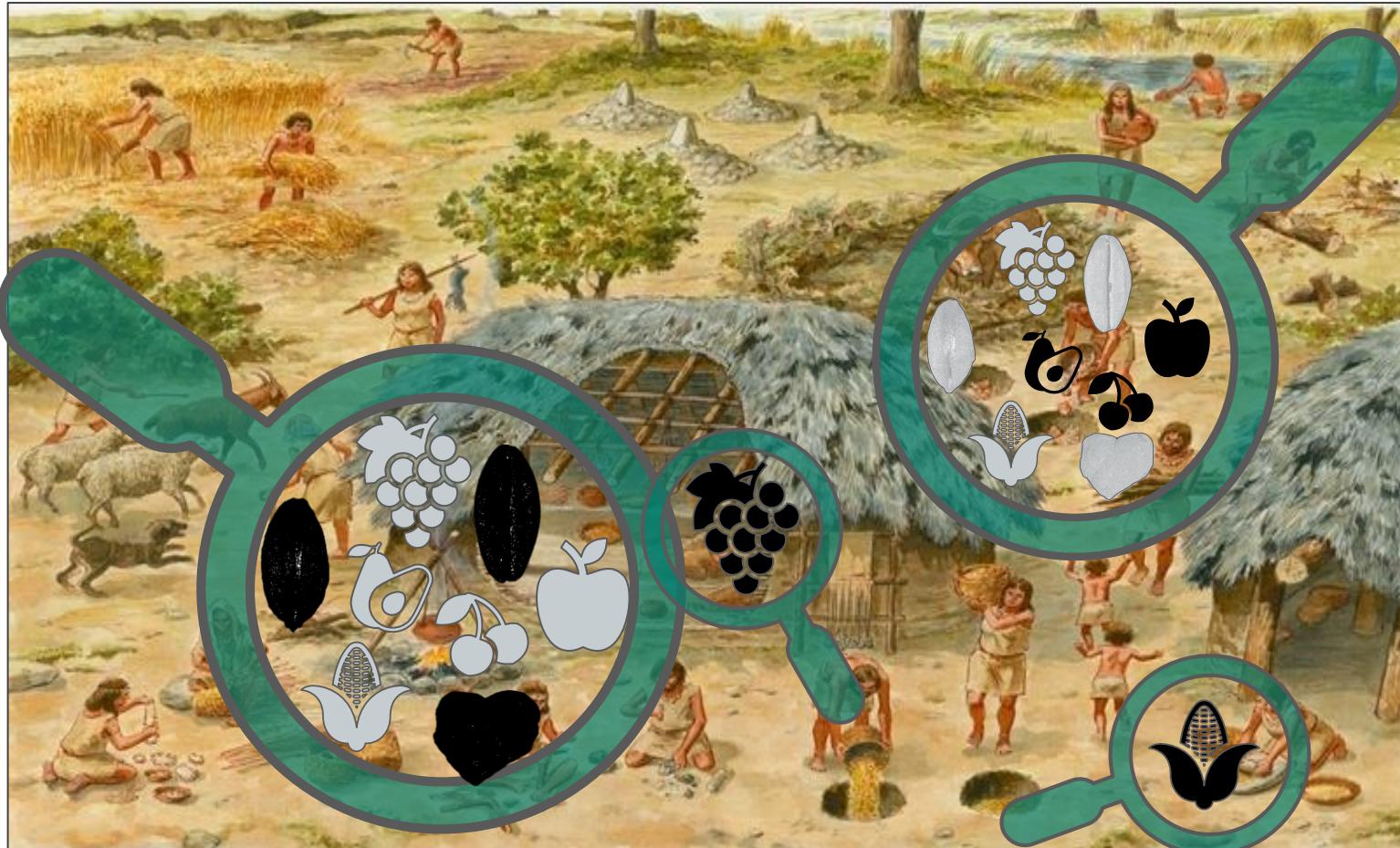
Processing

Analyzing



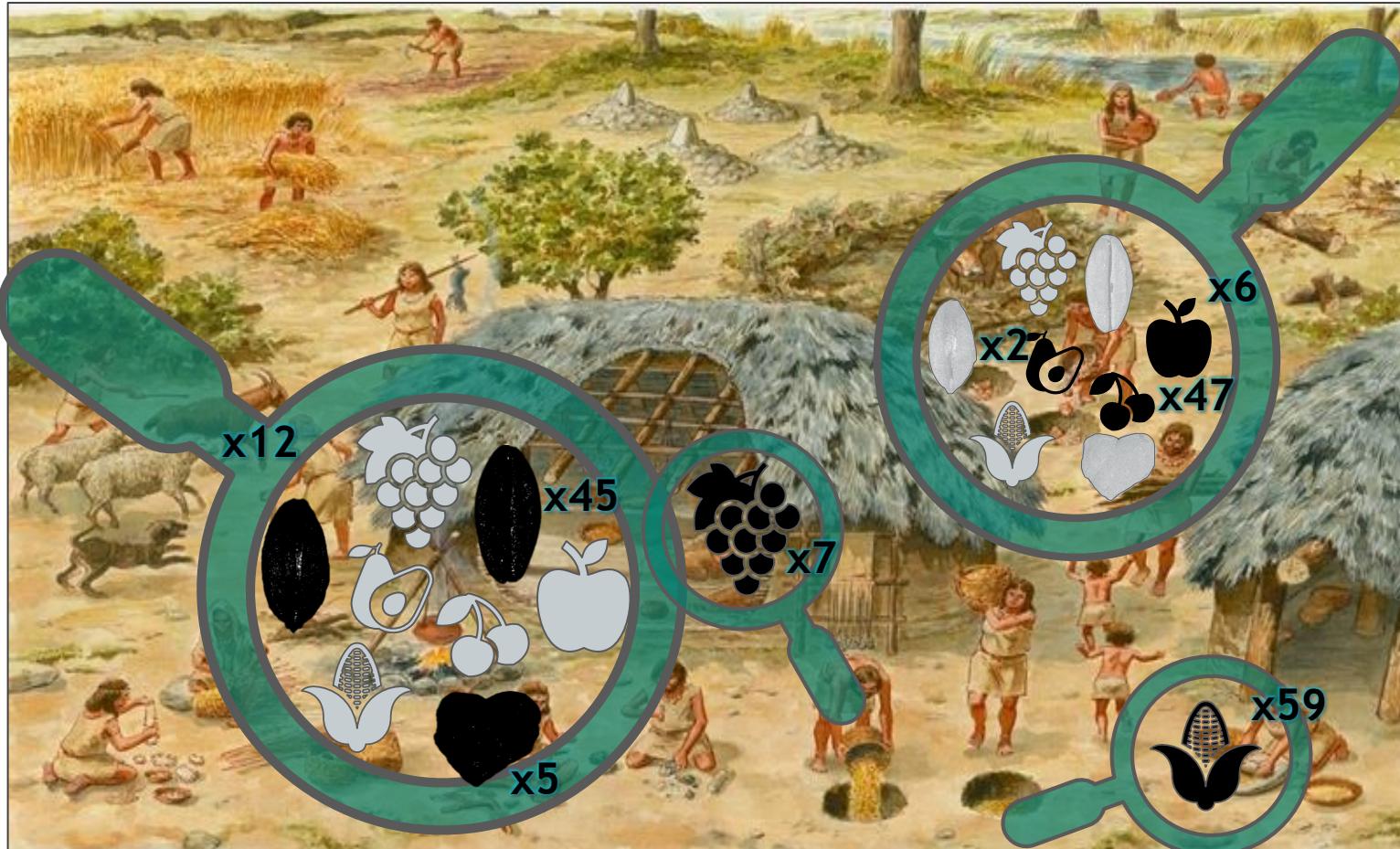
Plant Macrofossil Analysis

The composition data



Plant Macrofossil Analysis

The composition data



Sampling
strategy

Research ?

Fieldwork

Processing

Analyzing

www.tumteasstt.com



Plant Macrofossil Analysis

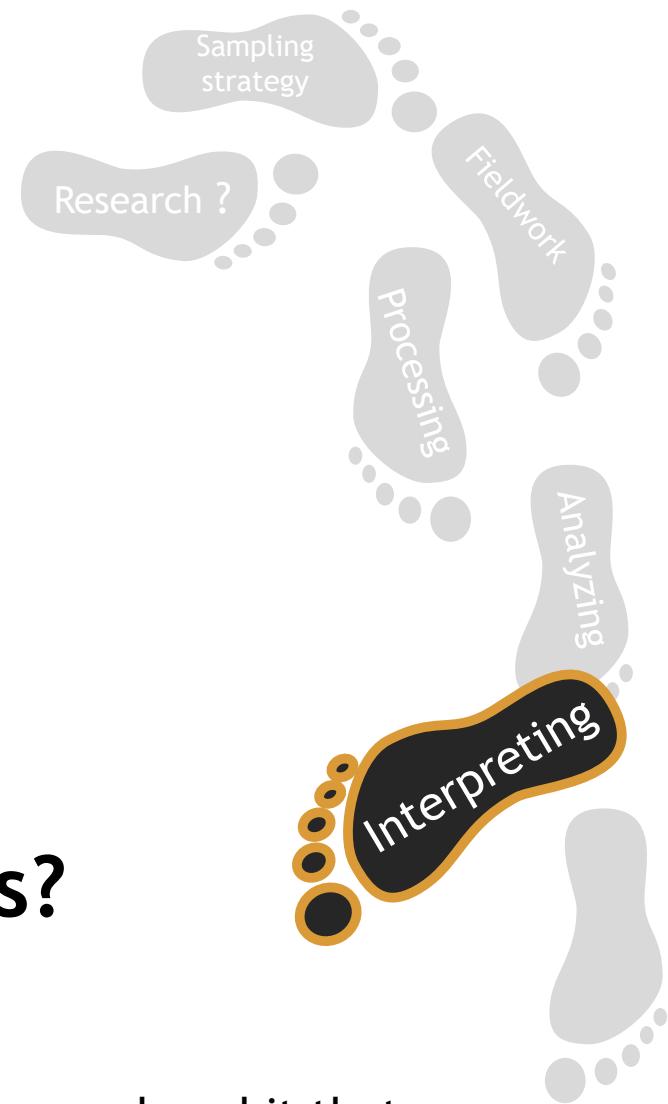
Step 6: Interpreting material

What does it all mean?

Context!

Other types of analyses?

Are there any biases in the way you collected data or analyzed it that may have influence your findings?



Plant Macrofossil Analysis

Step 7: Preparing for publication



Mir Makhmad et al., 2021



Ashastina and Kienast et al., 2018

Sampling
strategy

Research ?

Fieldwork

Processing

Analyzing

Interpreting

Preparing
for
publication



Good starting places for plant macrofossil analysis...

- See chapter 2 and 3 of Pearsall, D. (2015). *Paleoethnobotany*, 3rd Edition: A Handbook of Procedures, Left Coast Press.
- See chapter by Gayle Fritz and Mark Nesbitt in Marston, J.M., Guedes, J.D.A. and Warinner, C. eds., 2015. *Method and theory in paleoethnobotany*. University Press of Colorado.
- Plant macrofossil analysis in archaeological research by the FEDD team at MPI-SHH <https://iaas.shh.mpg.de/2021/07/06/plant-macrofossil-analysis-in-the-archaeological-research/>





Introduction to Plant Macrofossil Analysis Workshop

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Here we present a flotation
demonstration and take a closer look
at seed identification for beginners!



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History



Some important tips for bucket flotation...

- Before flotation
 - Storage of soil samples (material and record keeping)
 - Choosing a location (need access to clean water)
 - Make sure to have a plan- protocol and recording methods
- During flotation
 - Keep the amount in the bucket manageable
 - Work in a team
- After flotation
 - Recording
 - Drying and storage

**RECORD
EVERYTHING!!**



For more information about bucket flotation or other scholar's adaptations of the method check out the following links:

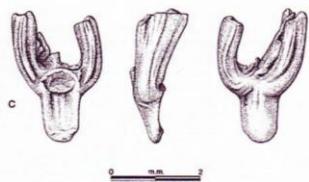
- Environmental Archaeology / Archaeobotany at the Institute for Prehistoric and Protohistoric Archaeology Kiel University (CAU)
<https://www.youtube.com/watch?v=jVNEAc-82Kc>
- Dorian Fuller’s “The Art of Flotation” <https://sites.google.com/site/archaeobotany/>
- Dorian Fuller’s Bucket Flotation <https://www.youtube.com/watch?v=Nbkfe0B4zBg>
- Naomi Miller’s “Recovering Macroremains by Manual Flotation and Sieving”
<https://www.sas.upenn.edu/~nmiller0/papers/Flot.instructions2012.pdf>
- Andrew Fairbairn’s
https://www.academia.edu/8539041/Simple_bucket_flotation_and_wet-sieving_in_the_wet_tropics



Cereals

Identification of cereal remains from archaeological sites

2nd edition
2006



Spikelet fork of the "new glume wheat" (Jones et al. 2000)

Stefanie JACOMET
and collaborators
Archaeobotany Lab
IPAS, Basel University
English translation partly by James Greig

- https://ipna.duw.unibas.ch/fileadmin/user_upload/ipna_duw/PDF_s/AB_PDF/Cereal_Id_Manual_engl.pdf



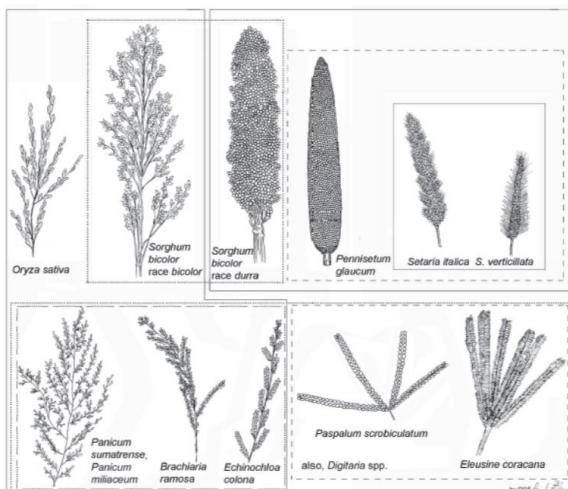
Millet

13. MILLET ATLAS:

Some Identification Guidance

(3rd edition, 2017)

by Dorian Q Fuller (Feb.2017)



[comparison of millet panicles from Fuller, D. Q (2006). Silence before sedentism and the advent of cash-crops: A status report on early agriculture in South Asia from plant domestication to the development of political economies (with an excursus on the problem of semantic shift among millets and rice). In Osada, T. (eds.), *Proceedings of the Pre-Symposium of RIHN and 7th ESCA Harvard-Kyoto Roundtable*, Research Institute for Humanity and Nature, Kyoto , pp. 175-213]

- https://www.researchgate.net/publication/333661449_Millet_Atlas_Some_Identification_Guidance_3rd_revision_2017



For more information contact us or check out some of these resources:

- <https://robertnspengler.com/fruits-of-eurasia-domestication-and-dispersal-fedd/>
- <https://www.ufg.uni-kiel.de/en/professorships-and-fields/archaeobotanik>
- <http://g.willcox.pagesperso-orange.fr/index.htm>
- <http://www.archaeobotany.org/links.php>
- <http://www.efloras.org/index.aspx>
- <https://dpa.web.rug.nl/>
- <https://sites.google.com/sheffield.ac.uk/archaeobotany/seeds>
- <http://archaeobotanist.blogspot.com/>
- <http://www.archaeobotany.de/>

Thank you for your attention!

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