

Archaeobotany

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<http://iza2.zrc-sazu.si/sl/strani/arheobotanika-stran-za-%C5%A1tudente-in-arheologe-na-terenu#v>

Archaeobotany

- Investigation of plant remains from archaeological sites
- plant macroremains ($> 0,355$ mm)
- plant microremains ($< 0,1$ mm)

Archaeobotanical research

- sampling strategy and sample preparation (extraction of plant macroremains from organic archaeological samples)
- classification of plant macroremains
- botanical identification
- counting and statistical analysis
- interpretation

Special archaeobotanical research

- dendrochronology
- morphological analysis
- genetic analysis
- others: coprolites, textile remains, remains of prepared food in vessels, remains of house daub, ...

Archaeobotanical results

- human nutrition
- agriculture : gathering economy
- origin of domestication (cultivation)
- autochthonous plant species
- environment, climate, vegetation in the past
- human impact on the environment
- absolute dating
- human capability, knowledge, inventiveness...

Bio-Archaeology

1. On-site data

Palaeoeconomy (human nutrition, cultivation, wood management, gathering, pasturing...)

2. Off-site data

Palaeoenvironment (past vegetation, ecological conditions)

Taphonomy

- process of preservation (fossilization) of biological (organic) remains:

charred, waterlogged, dried, frozen,
mineralized...

Charred or carbonized remains

- most frequent and often found
- charcoal, cereal grains and chaff, weed seeds
- oil seeds/fruits (i. e. flax, poppy) burn away
- if the fire is quick and sudden, more plant macroremains are preserved

porridge made from boiled millet



Mineralized remains

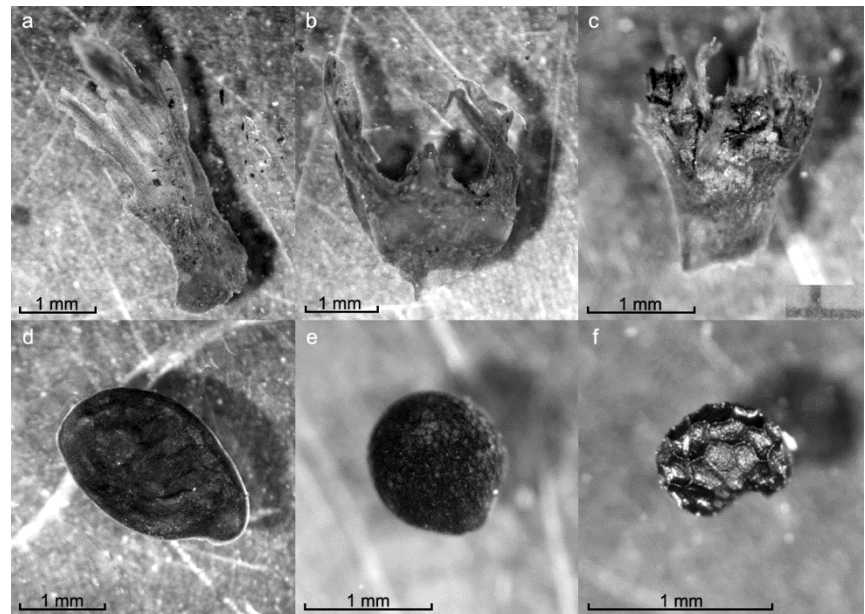
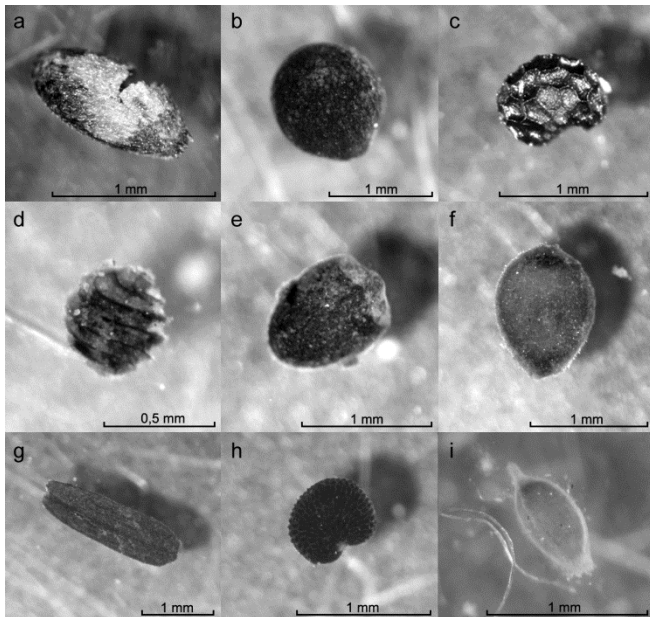
- the minerals replace organic material – i. e. scan the plant structure



textile „remains“ on iron fibula

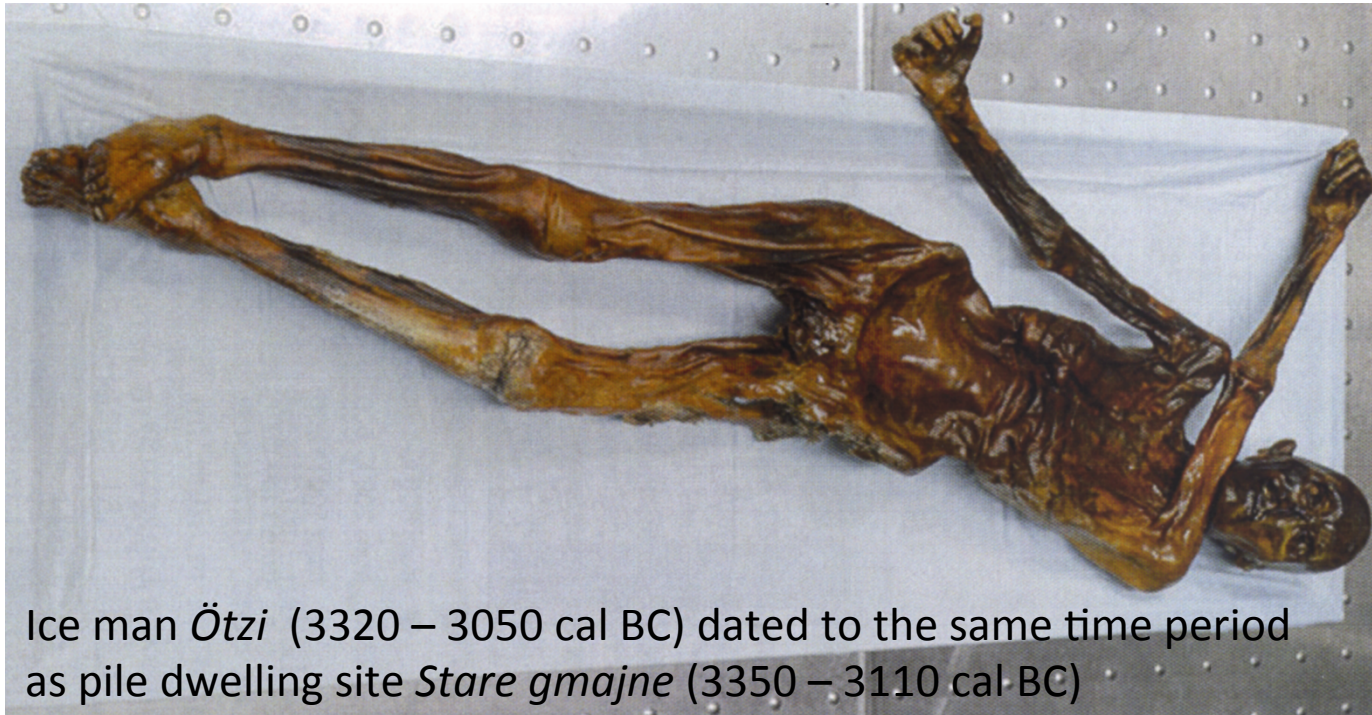
Waterlogged remains

- oxygen free sediments – organic remains are the best preserved
- Ljubljana marsh, lake and river sediments, wells, channels, ditches



Dried or frozen remains

- not so often in Slovenia
- fantastic finds of whole fruits, leaf, flowers, also humans and animals



Ice man *Ötzi* (3320 – 3050 cal BC) dated to the same time period as pile dwelling site *Stare gmajne* (3350 – 3110 cal BC)

1st phase of archaeobotanical research

- sampling in the field
- wet sieving (washing over) the sediment samples and preparing of archaeobotanical samples
- storing of plant material

2nd phase

examining, sorting, identification...

SHOULD BE DONE BY ARCHAEOBOTANIST !

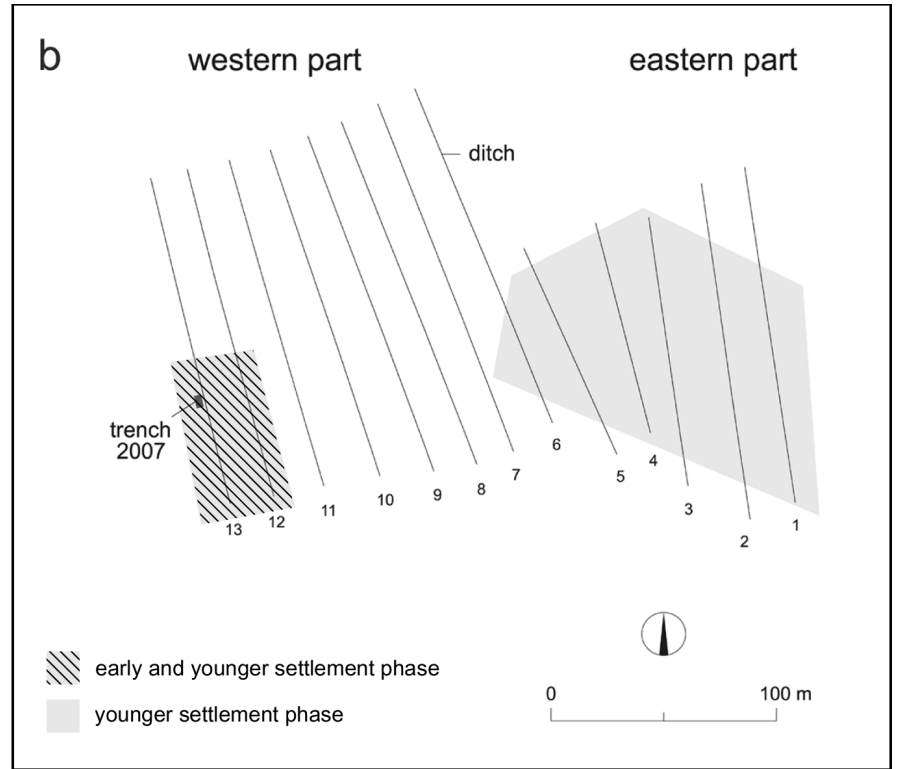
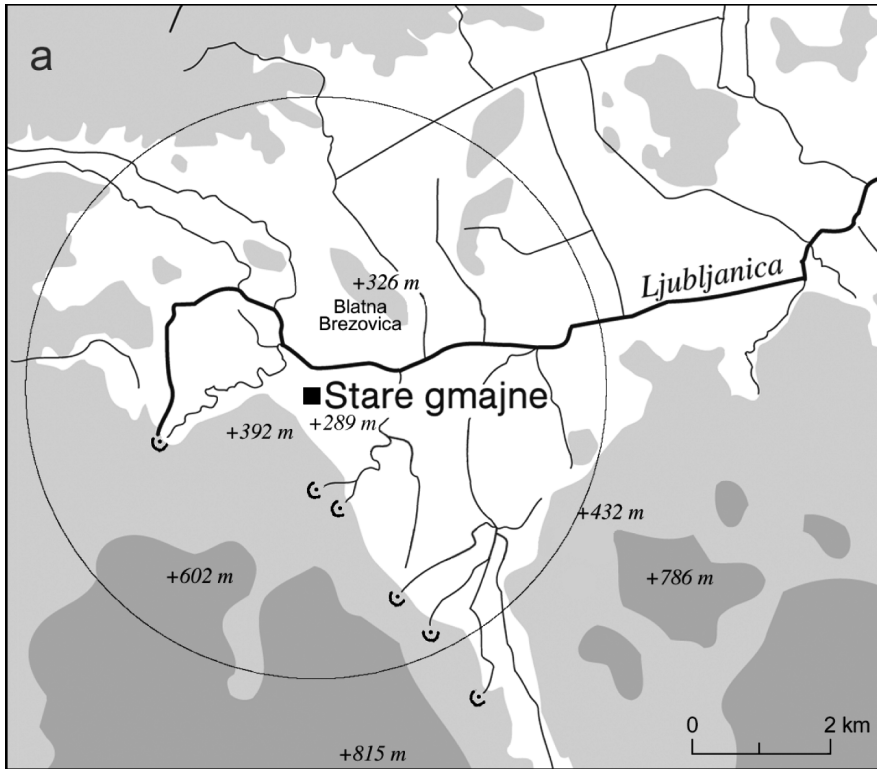
Sampling methods

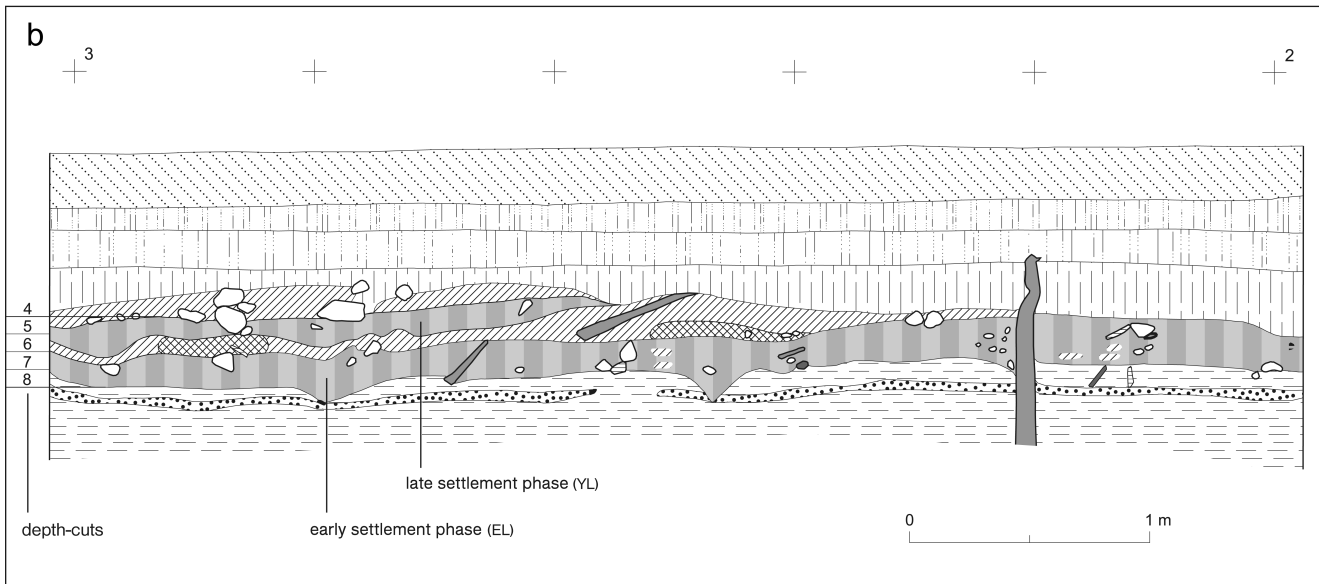
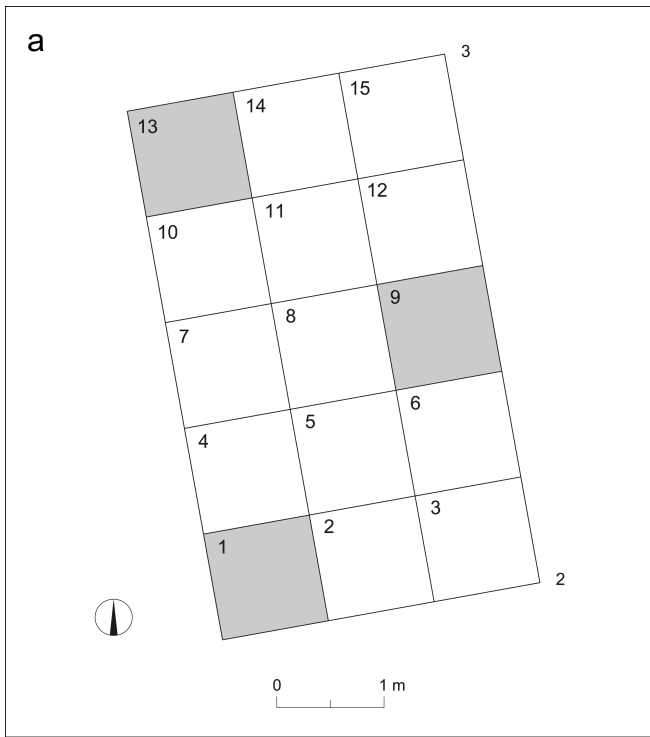
1. Surface sampling (površinsko vzorčenje)
2. Profile sampling or sampling with stratigraphic columns (vzorčenje z odvzemom stratigrafskih stolpcev)
3. Judgement sampling (vzorčenje po presoji)

1. Surface sampling

Samples are systematically collected during the excavation:

- a) vertically – i.e. layer by layer AND
- b) horizontally – i.e. from previously defined places within the excavated area



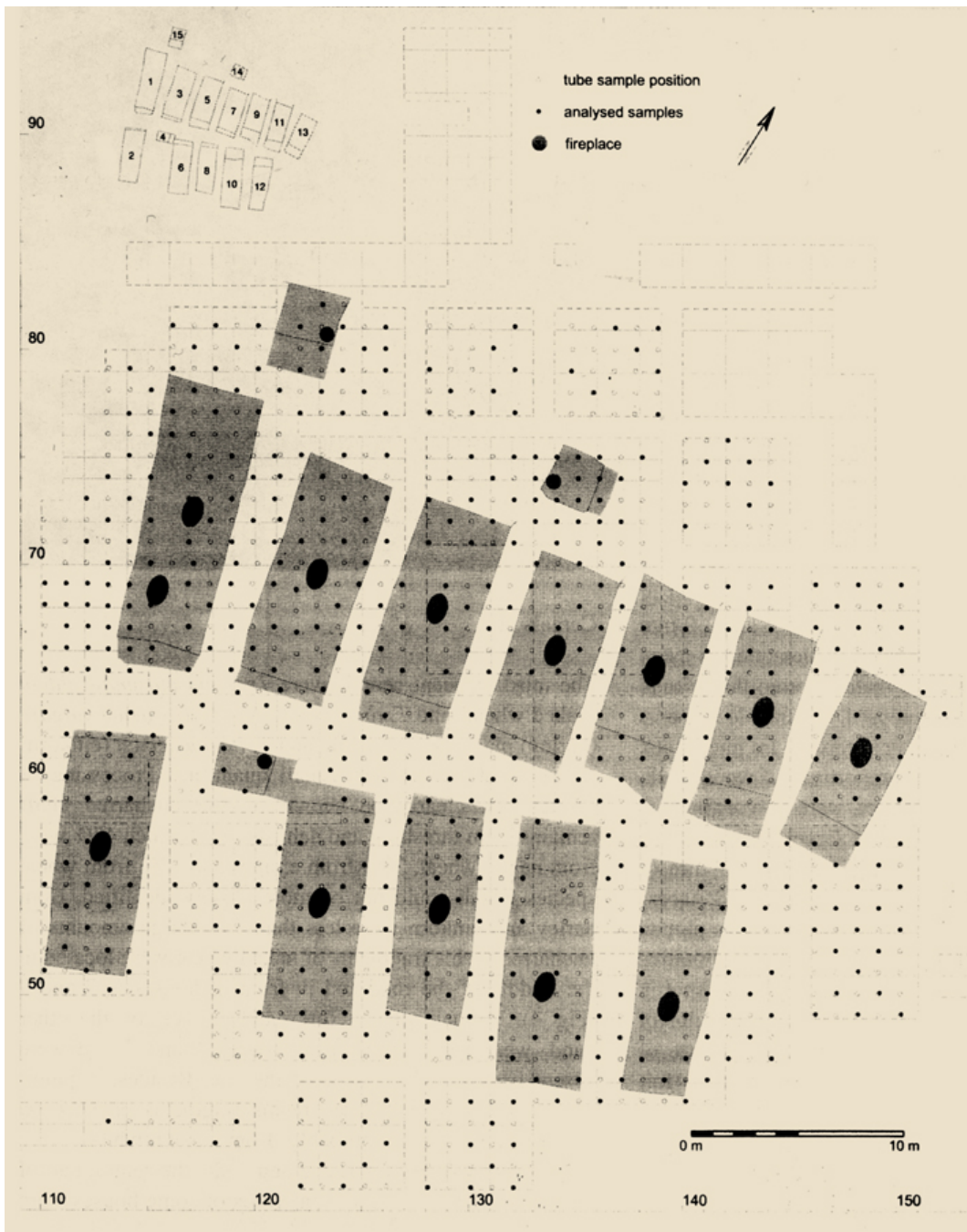


2. Profile sampling

Samples are collected at the end of the excavation:

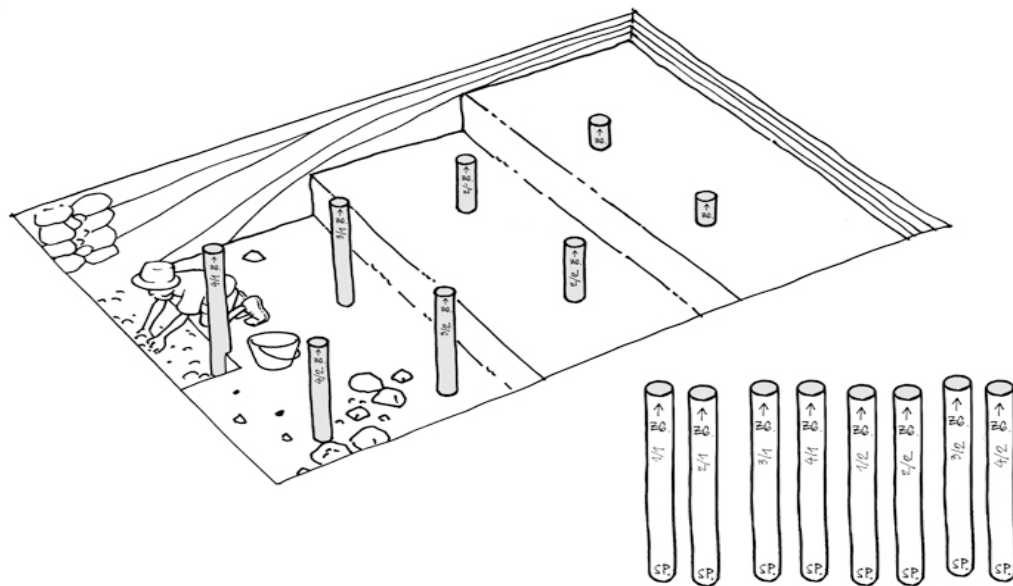
- a) columns of sediment in plastic tubes OR
- b) columns of sediment from the profiles



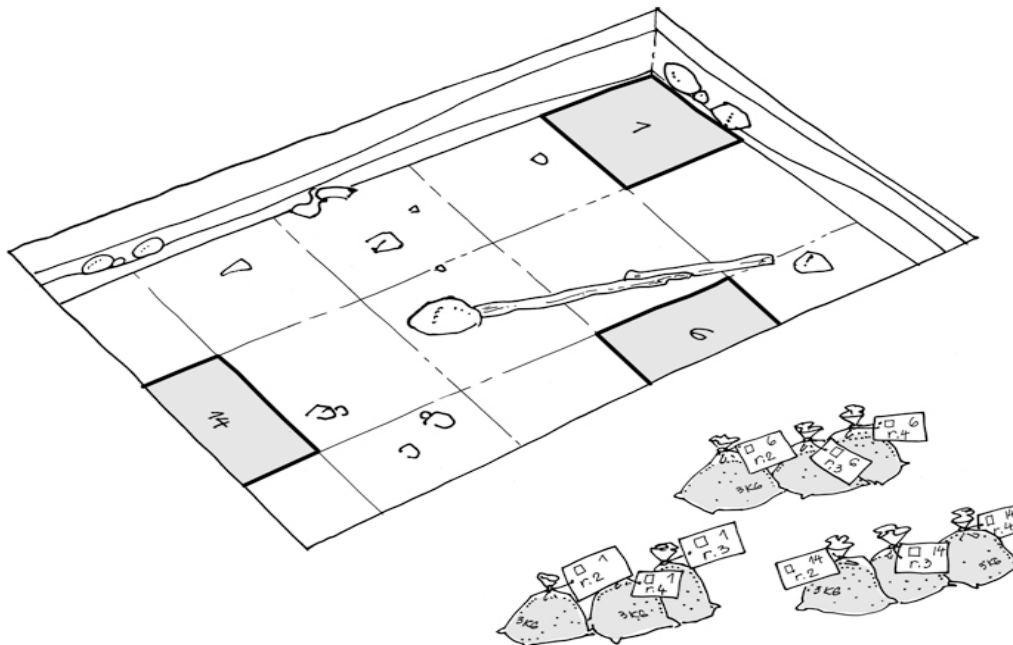




a



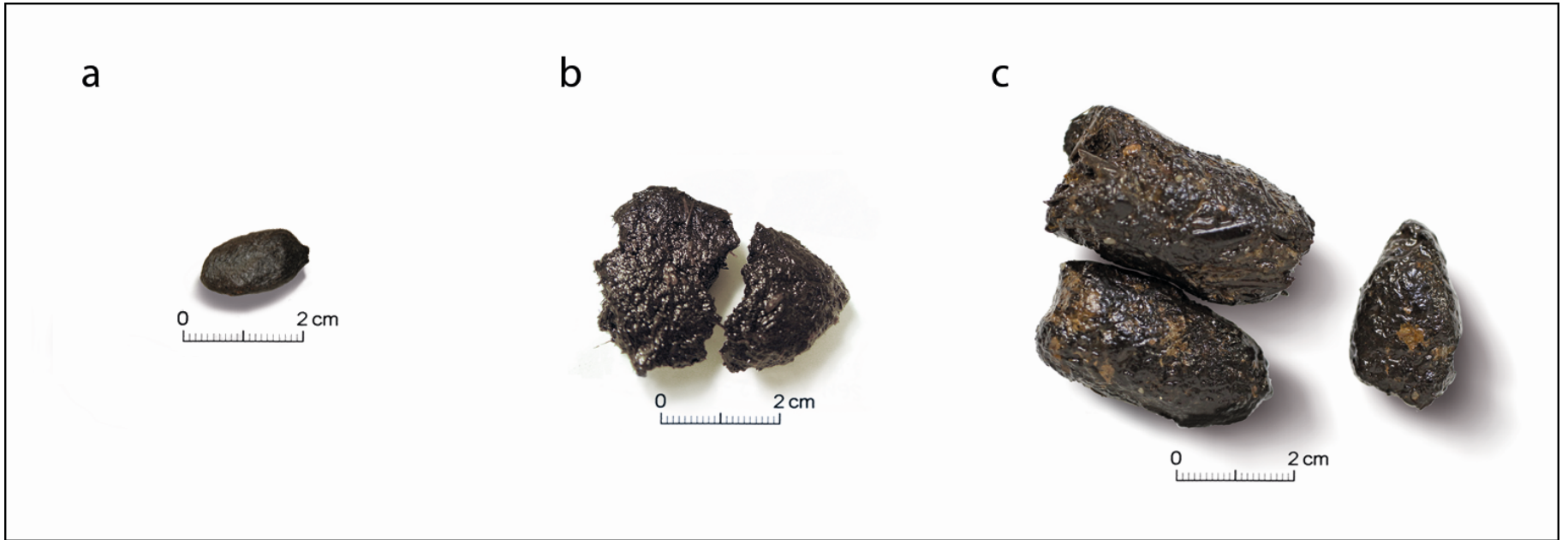
b

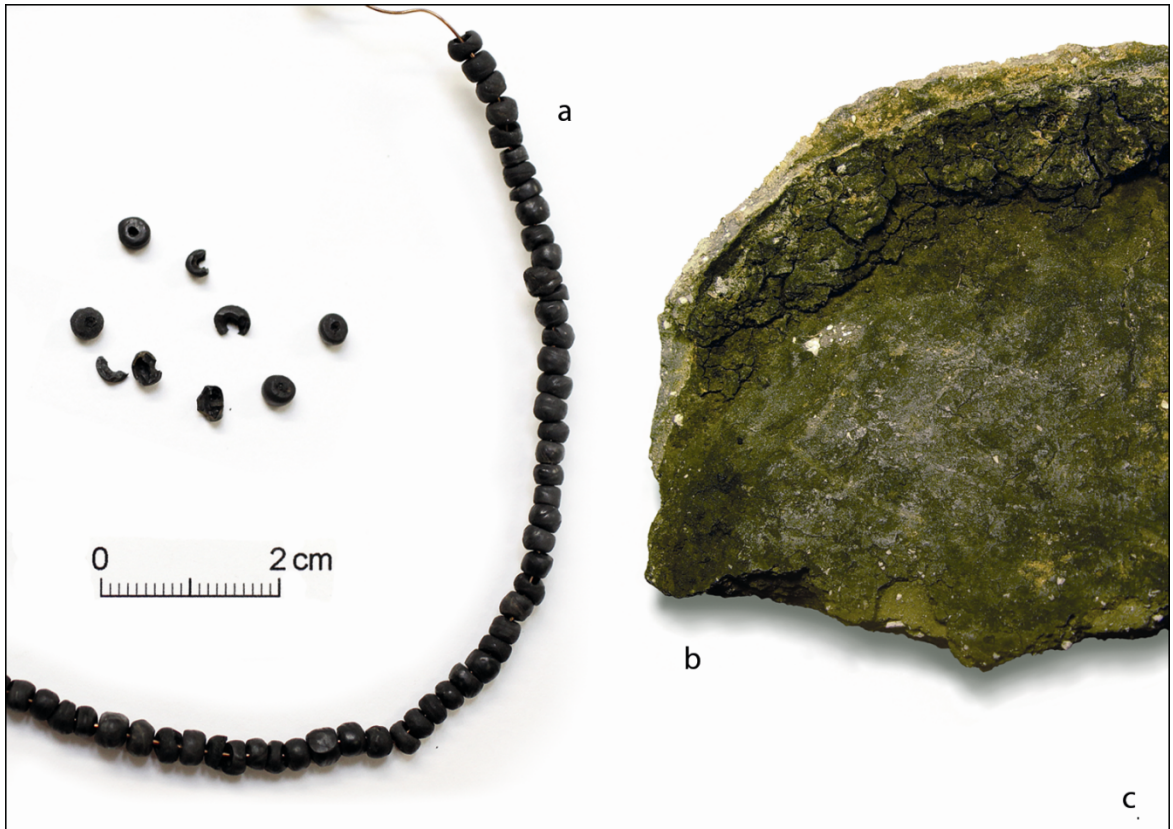


3. Judgement sampling

- coprolites
- textile remains
- remains of fodder and litter
- food residues in vessels
- cereal storages
- fire-places
- inside / outside the houses
- ditches, cloacas, rubbish pits

Coprolites: a) goat/sheep, b) cow, c) dog





Food residues



Textile remains, yarn

a



b



0 2 cm

c



č



0 2 cm

d

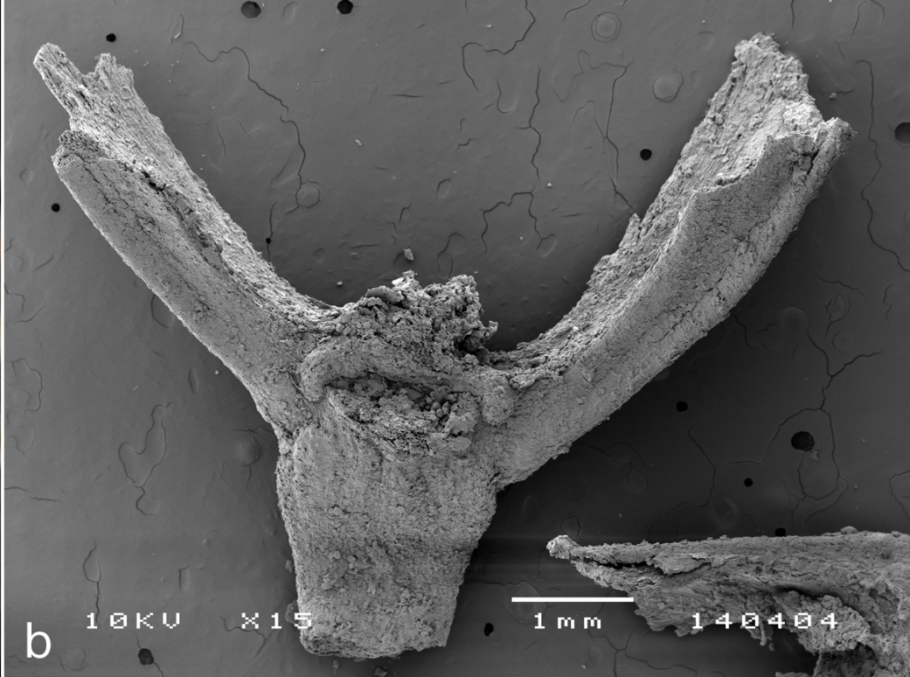


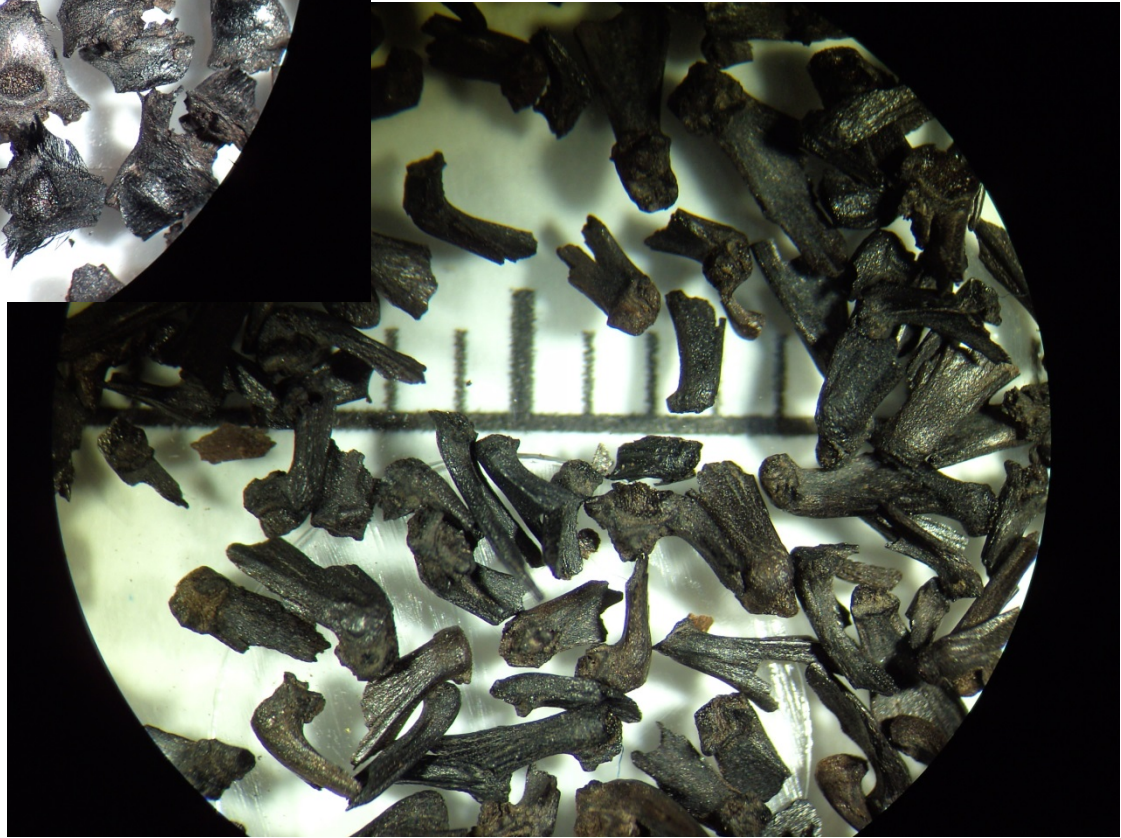
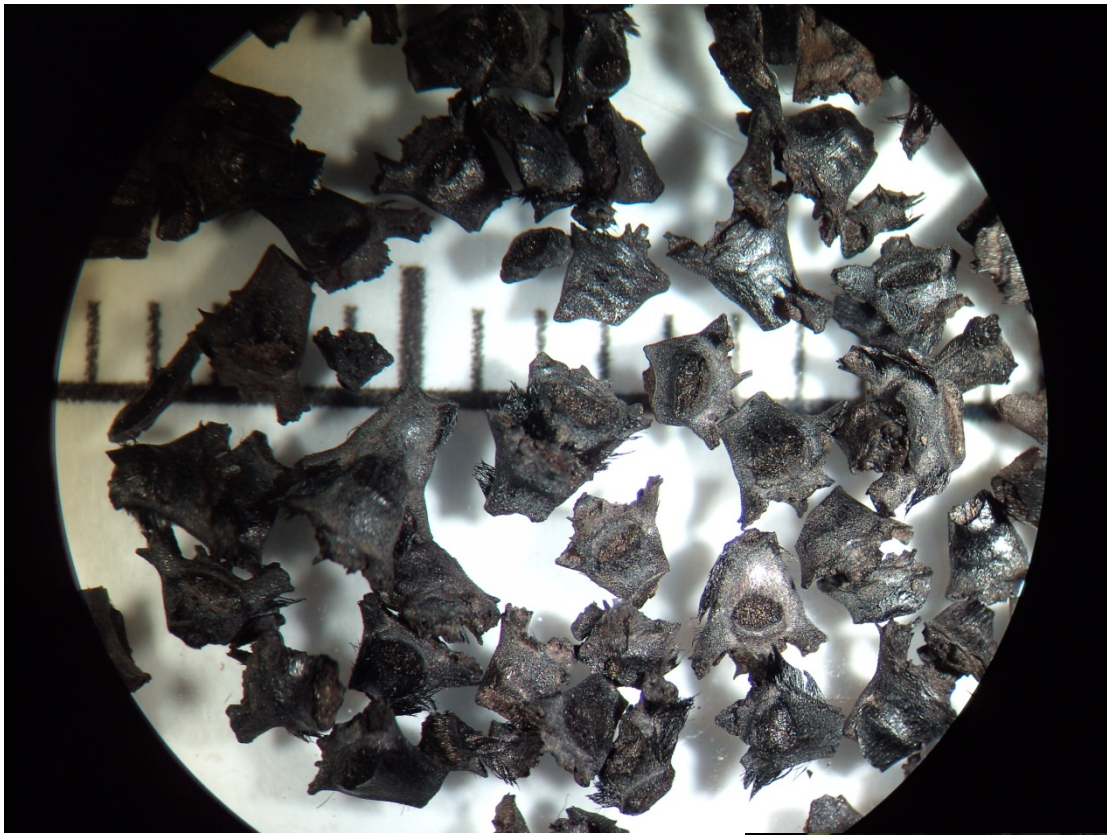
0 5 cm

Cereal chaff in unburnt material from the loom-weight



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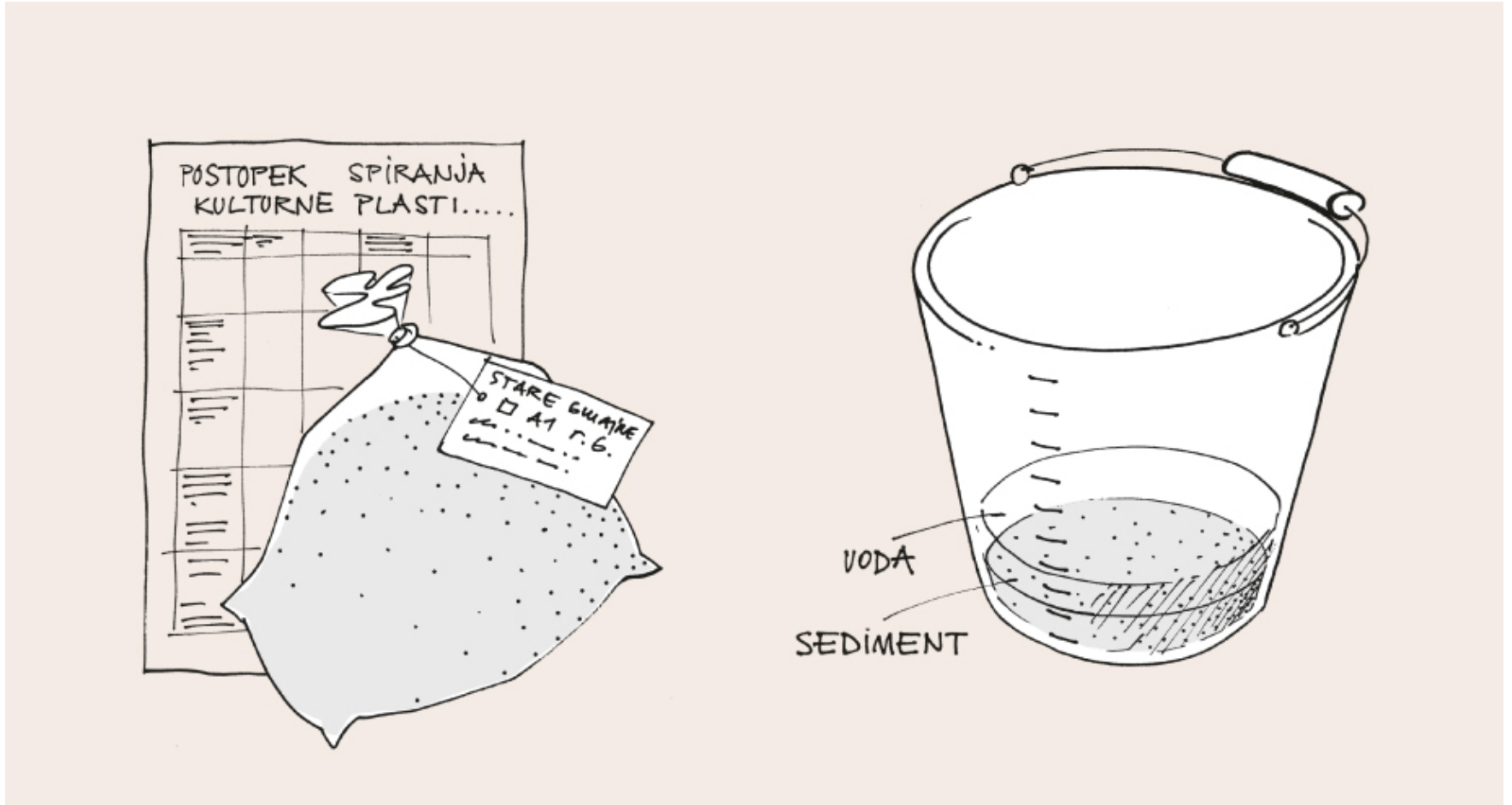


Wet sieving or washing over

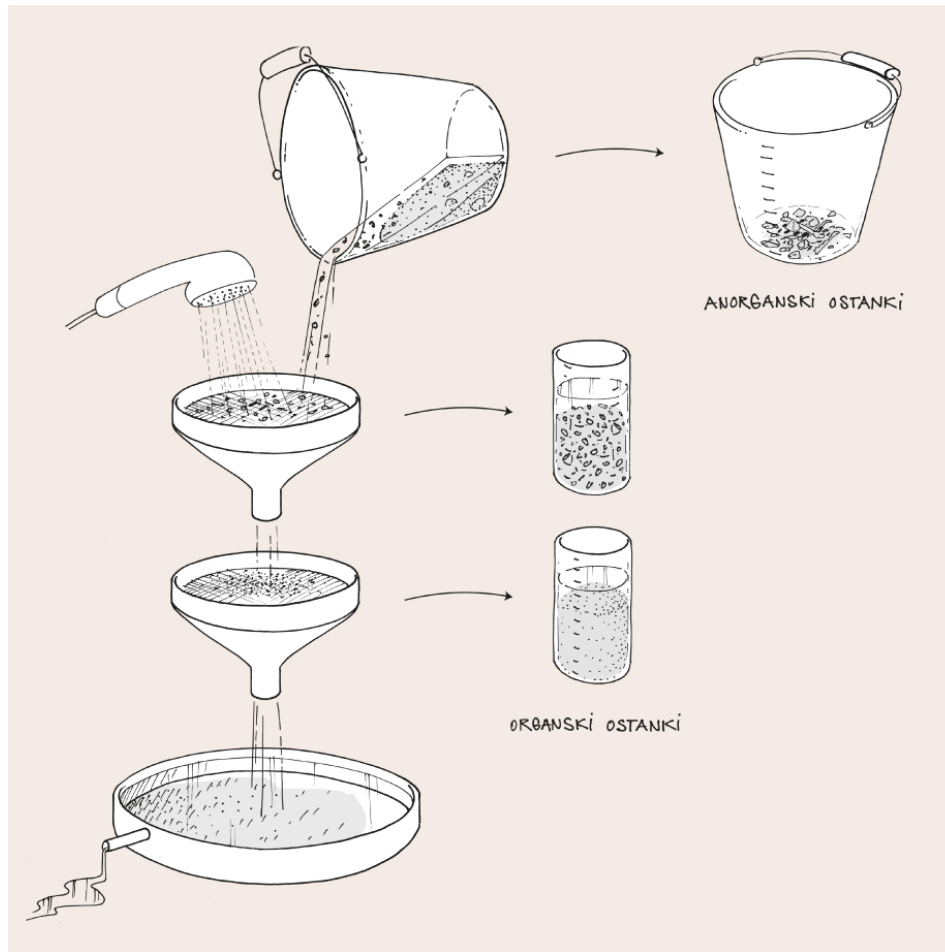
- gentle washing over with a shower and half-flotation
- over two sieve mesh sizes: 2 mm and 0,355 mm



Before sieving: measure a volume of the sediment sample



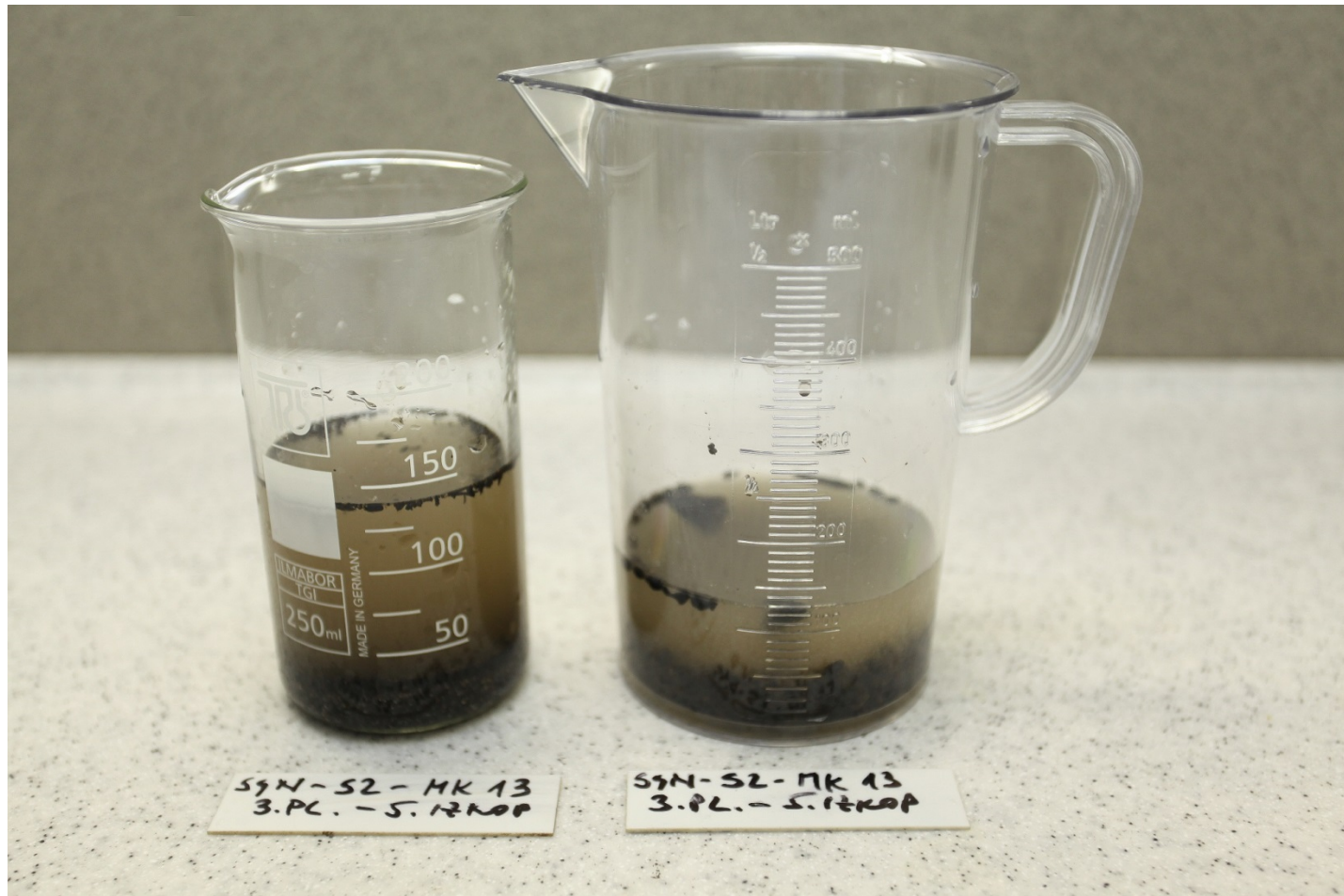
Half-flotation



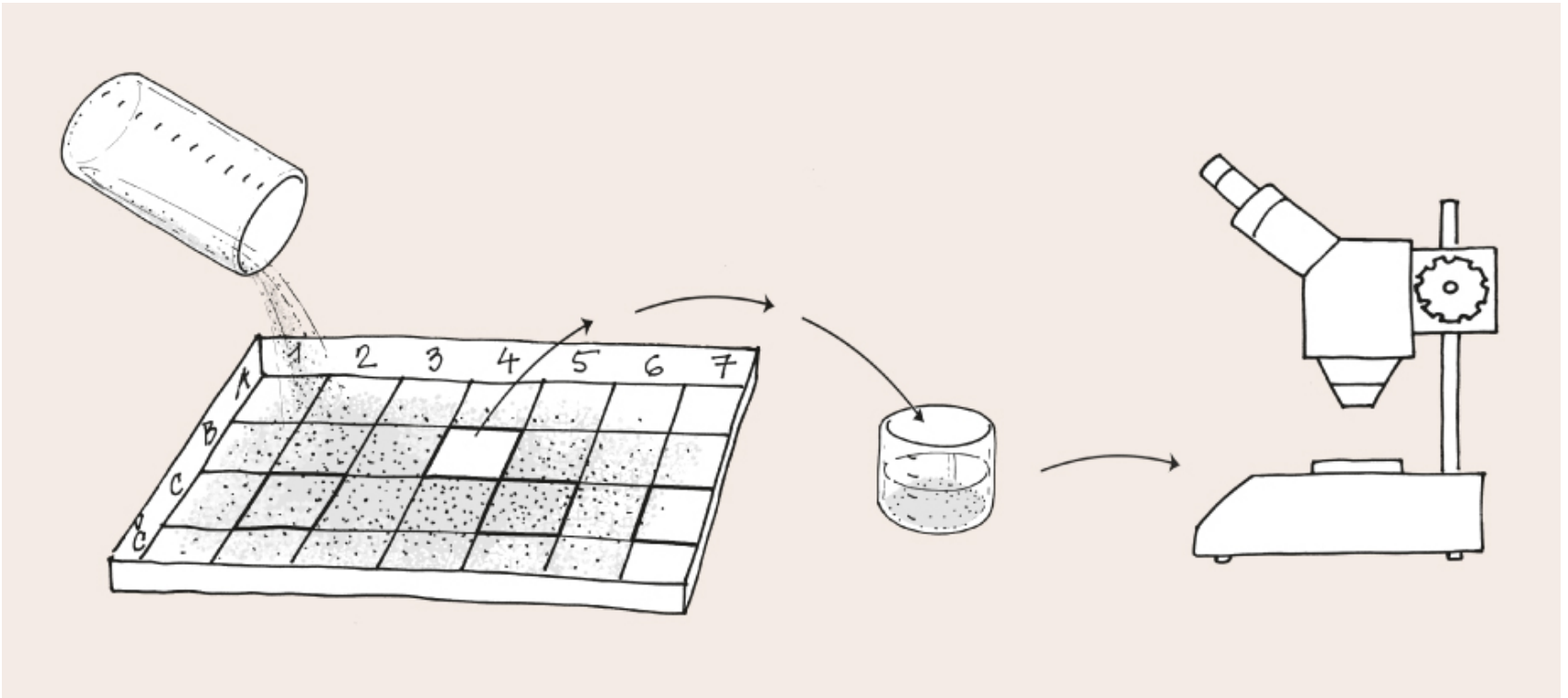
Inorganic residues

Two organic fractions: 2mm and 0,355 mm

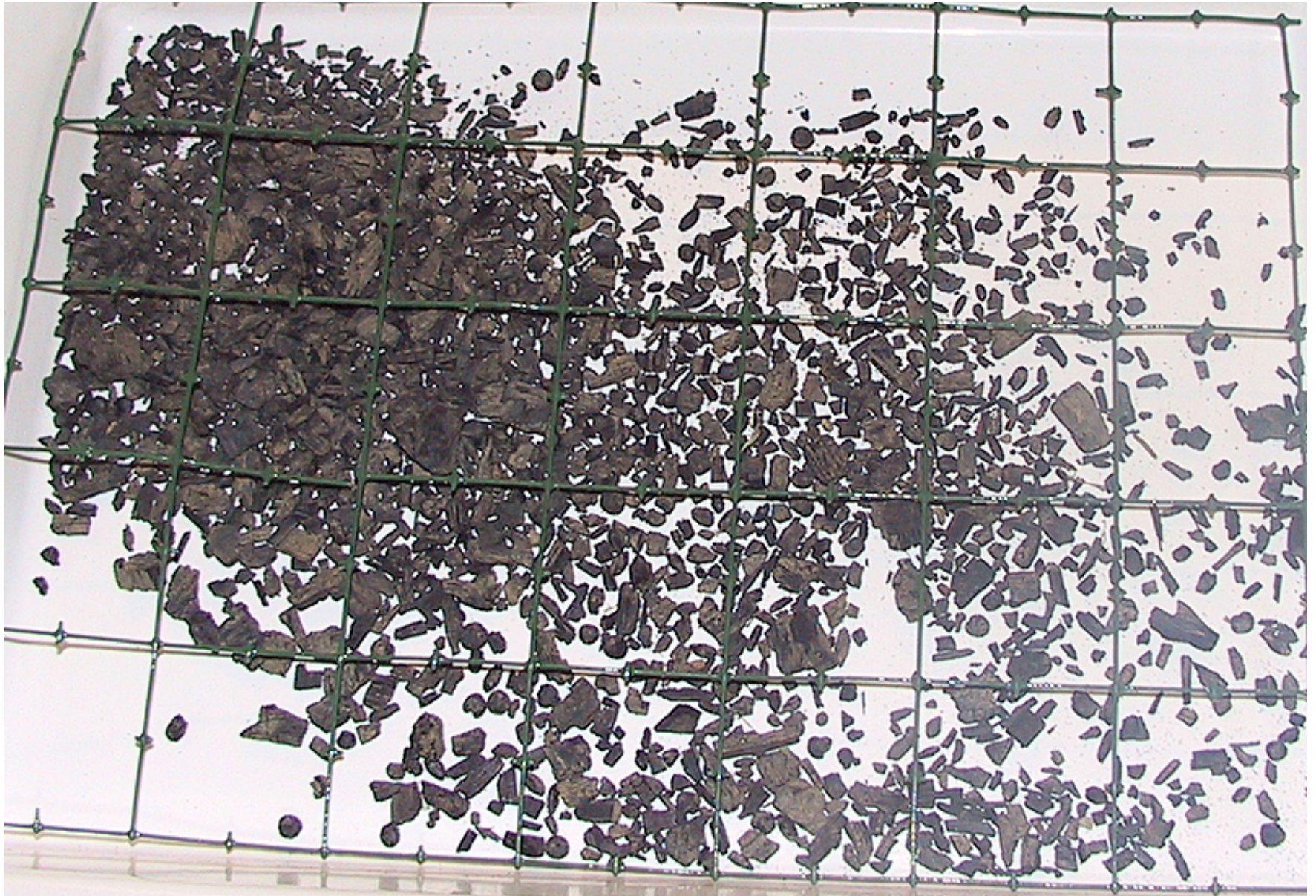
After sieving: measure a volume of the organic fractions



Sub-sampling if necessary



Often for 0,355 mm fraction of waterlogged plant macroremains





Sorting, identification,
counting under a
stereomicroscope



Storing the samples

- sediment samples should be kept in PVC bags, in dark and at low temperature
- they should be washed over sieves soon after excavations
- wet sieved organic fractions from the sieves full of waterlogged preserved botanical macroremains must be kept in waterlogged state and at low temperatures

- 2 mm and 0,355 mm fractions have to be kept and examined separately
- charred, mineralized, dried material can be dried after sieving
- be careful with the material – it is fragile !

Working sheets

Postopek spiranja sedimenta iz kulturne plasti za analizo makrorastlinskih ostankov

ident. št. vzorca:		datum odvzema vzorca na terenu:	
ime spiralca:		datum in čas spiranja vzorca:	
arheološko najdišče:		tip naselbine:	
arheološko obdobje:		št. kvadranta:	
št. podvzorca:		stratiografska enota plasti:	
TIP SPIRANJA:		TIP SEDIMENTA:	
pol-flotacija		organsko	
gold-wash		ilovica	
mokro sejanje		potžarica	
flotacija		peščeno	
drugo:		drugo:	
VOLUMEN VZORCA:			
odzem na terenu (kg):			
pred spiranjem (l):			
po spiranju (ml):			podvzorec - odzem za analizo
	organsko	anorgansko	
2 mm frakcija			
0.355 mm frakcija			
SHRANJEVANJE VZORCA:		VZOREC S TERENA:	
mokro, hladnik, temno		moker	
suho		suh	
PRISOTNOST MATERIALA:		OPOMBE:	
ogljje			
semena, plodovi			
les, veje, lističi			
keramika			
opeka			
kovina			
kosti			
moluski			
ribe			
drugo:			
LEGENDA:	X	posamezen	
	XX	nekaj	
	XXX	veliko	

Priloga 2: Klasifikacija materiala v vzorcu/podvzorcju št. _____

anorganski material	2 mm	0.355 mm		
arheološke najdbe	kamni			
	konkrekcije			
	kepe ilovice			
	drugo:			
	keramika, opeka			
	kovinski predm.			
rastlinske najdbe	steklo			
	obdelan les			
	tekstil, usnje			
	drugo:			
	a) mineralizirane	plodovi, semena		
		fragm. lesa		
	skup. org. material/ztrebki, hrana			
	drugo:			
b) karbonizirane	plodovi, semena			
	fragm. lesa			
	lube, skorja			
	veje, lističi			
	amorfni objekti			
	drugo:			
c) subfosilne, nekarbonizirane	plodovi, semena			
	fragm. lesa			
	lube, skorja			
	veje, lističi			
	korenine			
	skup. org. material/ztrebki, hrana			
	drugo:			
d) strohnele	ostanki:			
	e) slano - konservirane	ostanki:		
	f) kovinsko - konservirane	ostanki:		
Živalske najdbe	a) kosti	kosti, zobje velikih sesalcev		
		kosti, zobje malih sesalcev		
		ptice		
		dvoživke, plazilci		
		vrelenca rib		
		luske rib		
	b) moluski			
	c) drugi žival. ostanki	insecta - odrasli		
		insecta - larve		
		drugo		

LEGENDA: X posamezno
 XX malo
 XXX veliko
 XXXX prevladuje

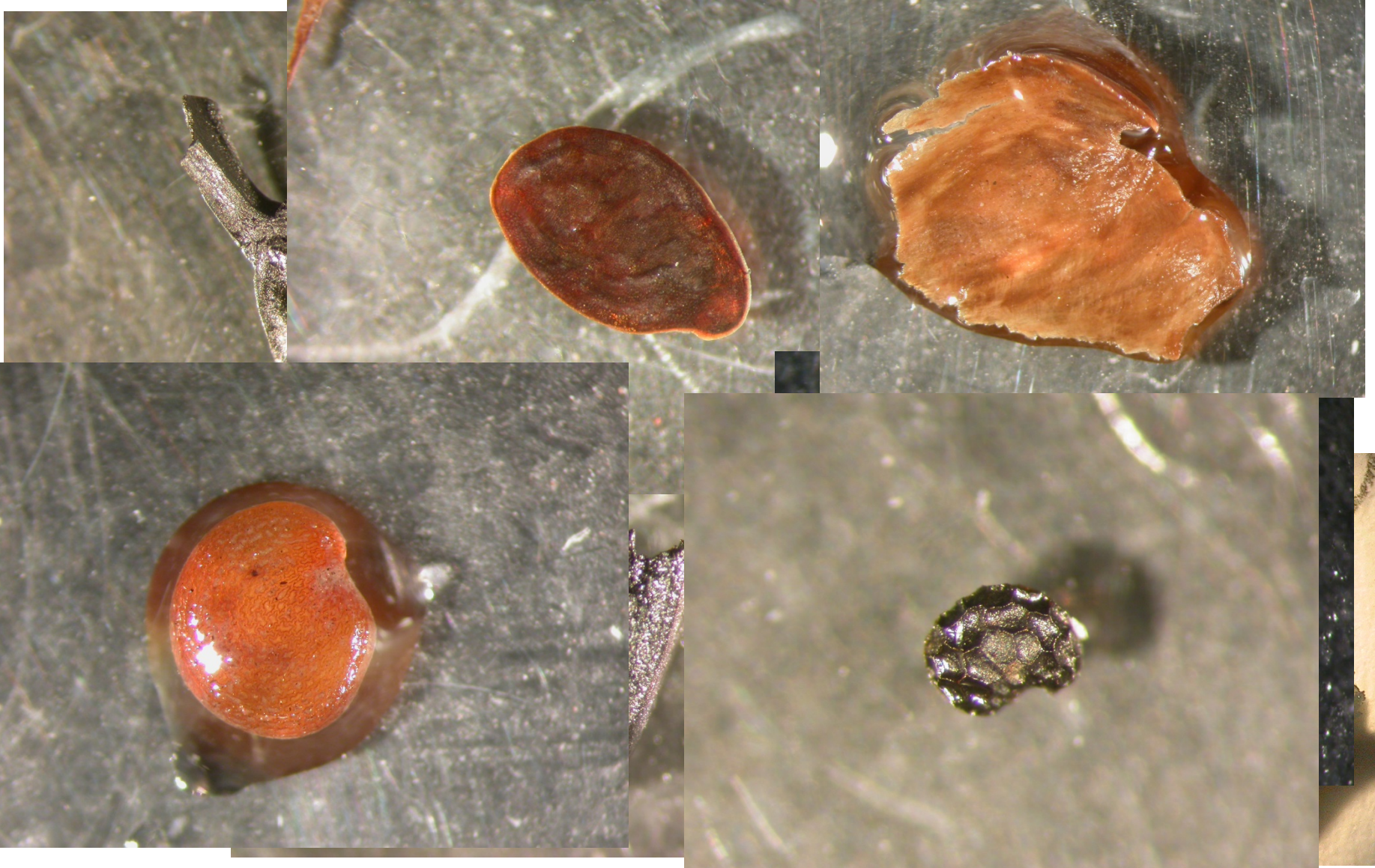
It has to be written down:

- type of the sediment
- volume of the sediment samples
- archaeological context
- sieve mesh sizes used
- volumes of the organic fractions from the sieves
- volumes of the examined sub-samples

Excavations at Ljubljansko barje



Archaeobotanical finds



a



b



c



č



d



a



b



c



č

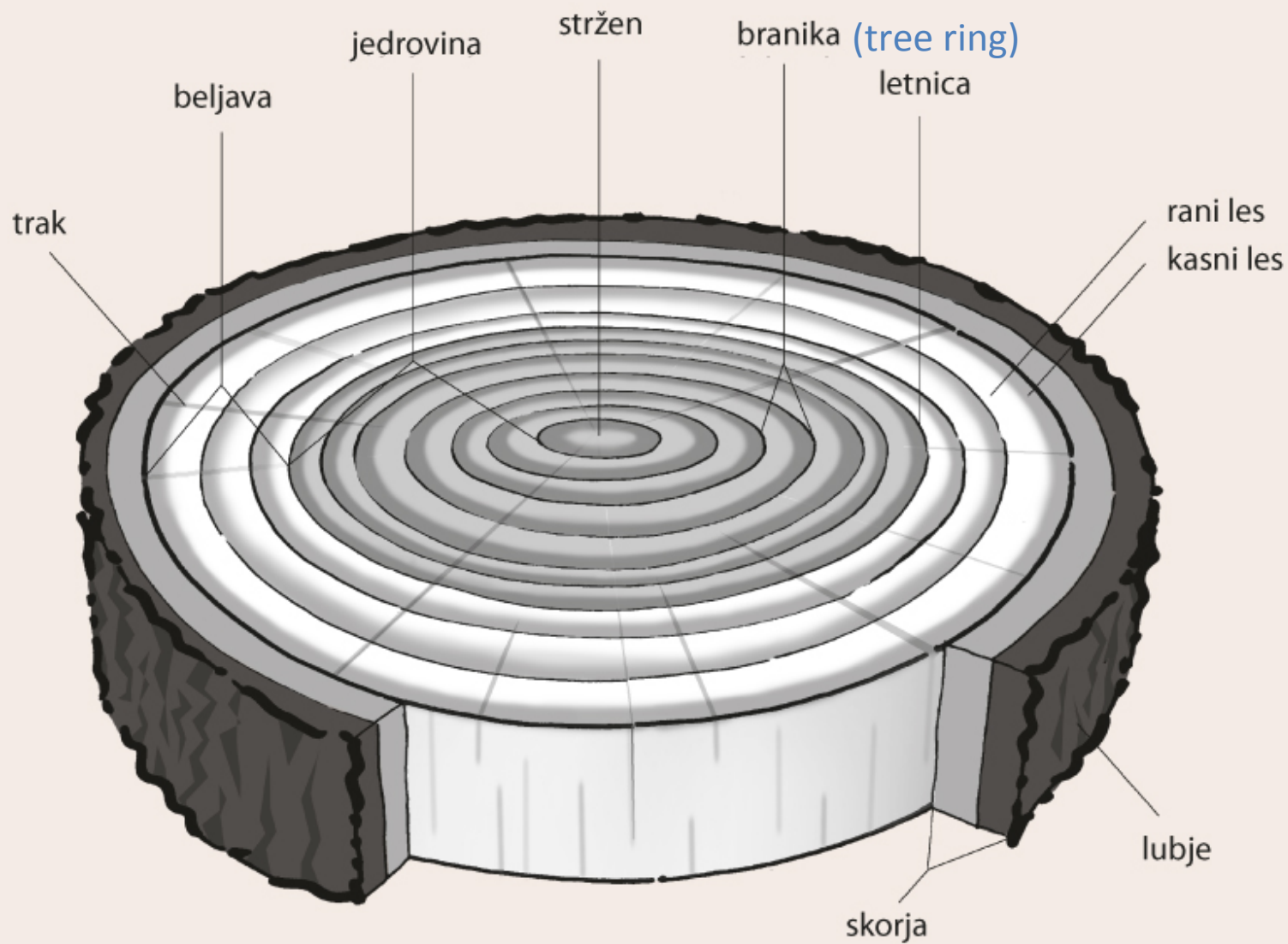


d

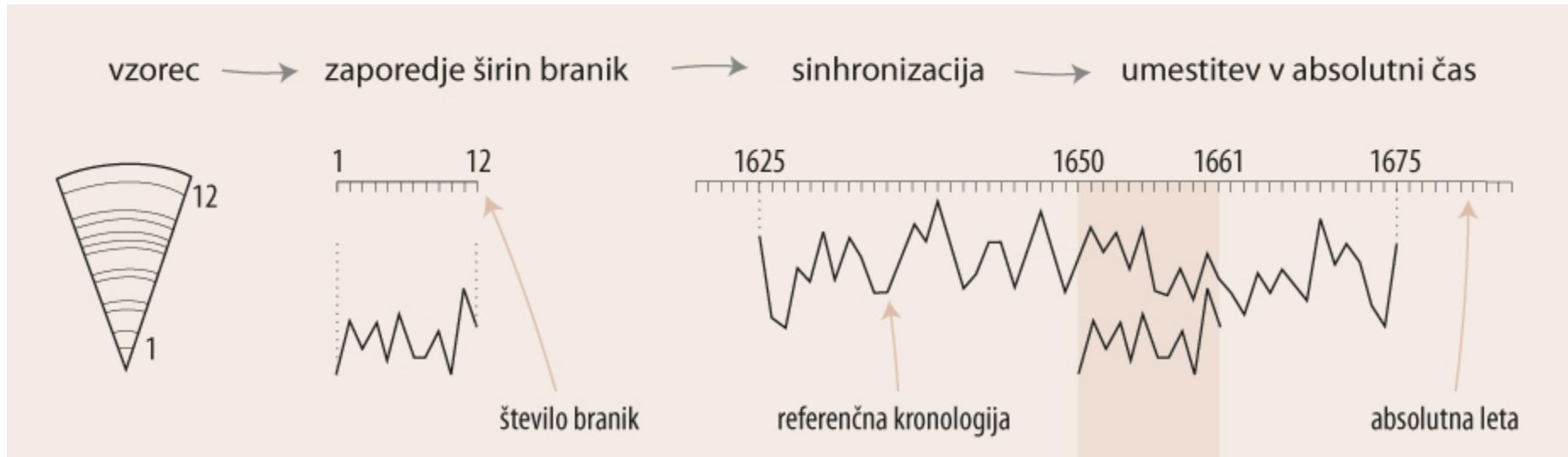


Dendrochronology

- analysis of tree ring width (i. e. one year growth of the tree)
- to determine the absolute age of the wood
- the fact: ring width depends on seasonal circumstances (climate, temperatures, ...) in the time of growing. Therefore it is possible to distinguish, determine and date every year (annual) tree ring

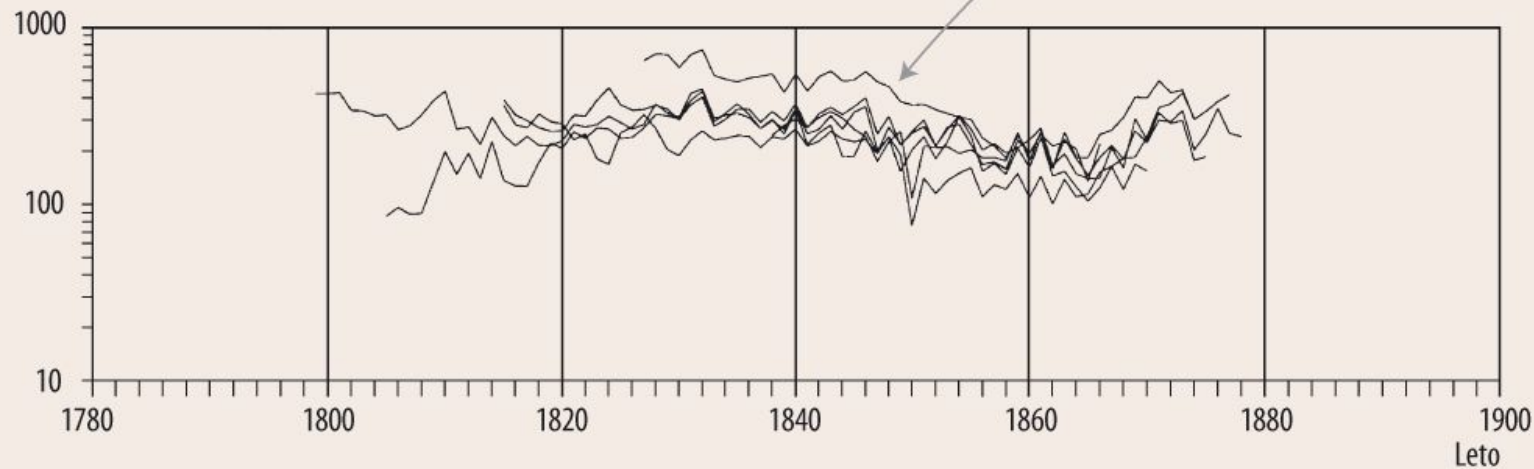


In the trunk (of a tree) heterogeneous tree rings are formed in dependence of the environmental circumstances. Annual tree ring succession is measured and graphically compared.



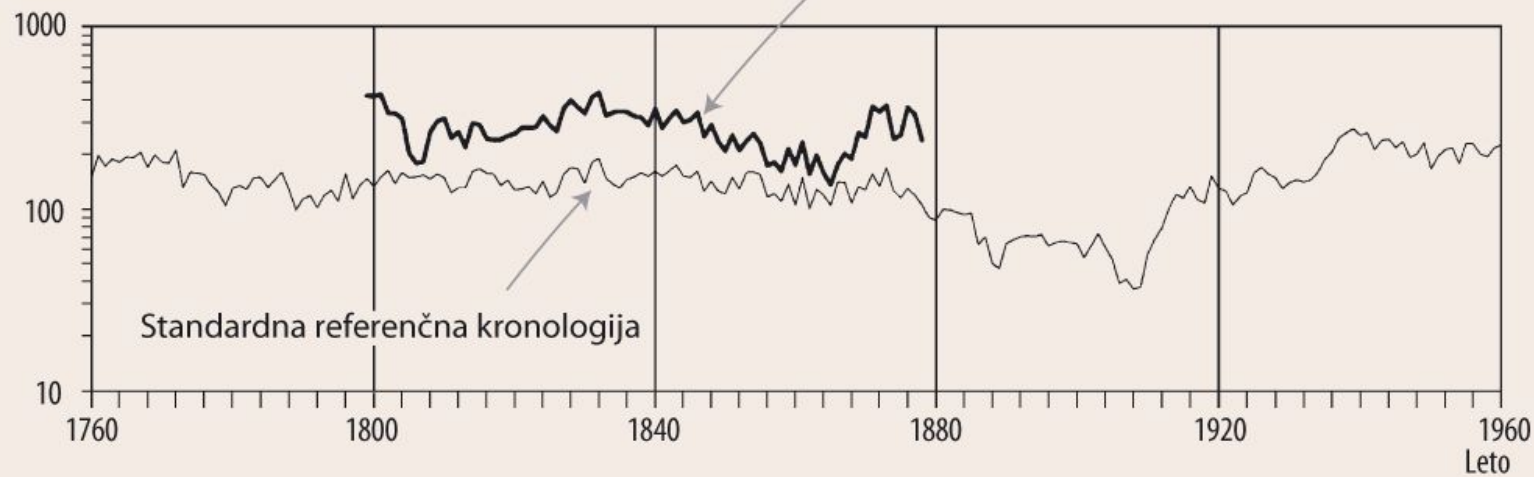
a

Zaporedja širin branik v sinhroniziranem položaju

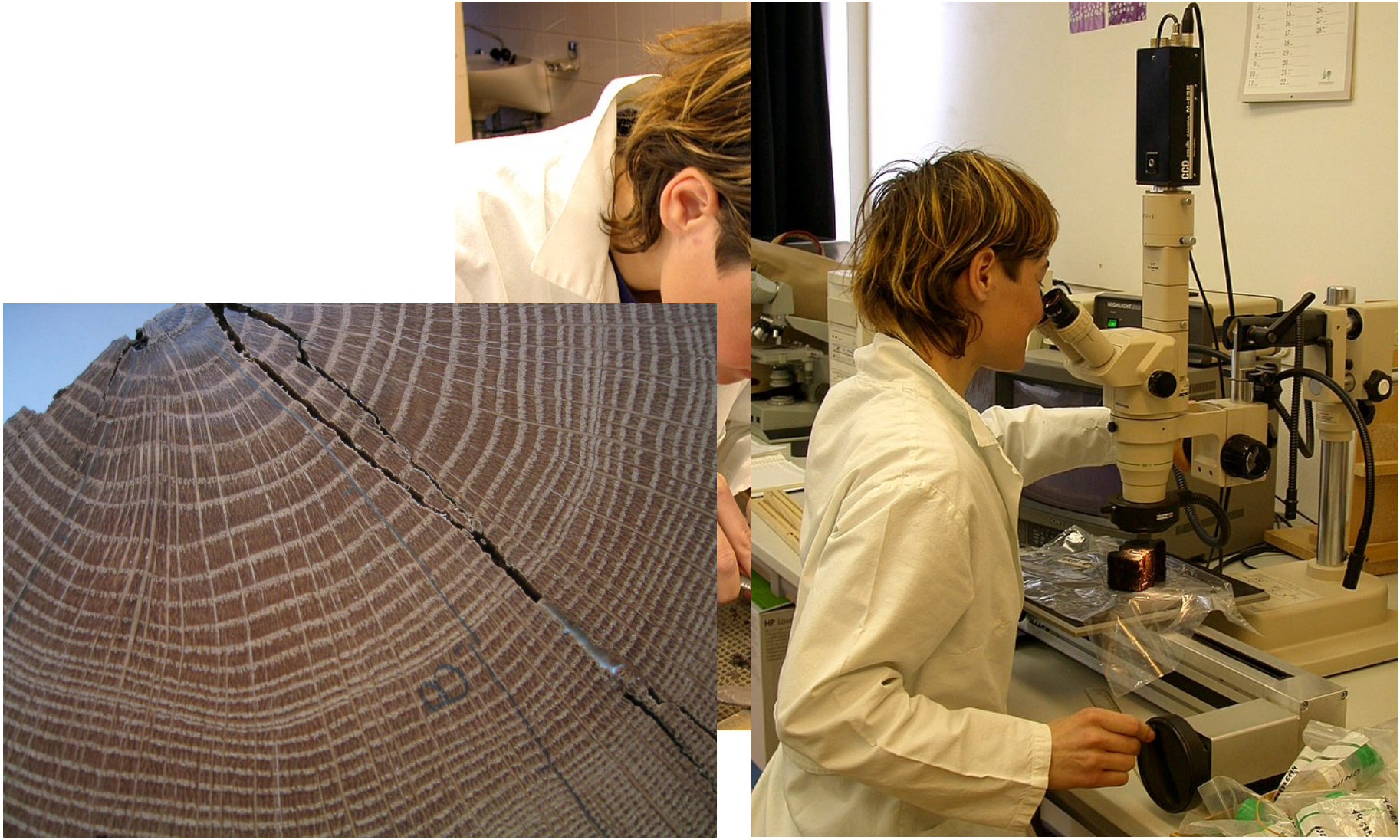


b

Kronologija objekta



Dendrochronological laboratory



Archaeobotanical investigations at the sites of Ljubljansko barje, Slovenia

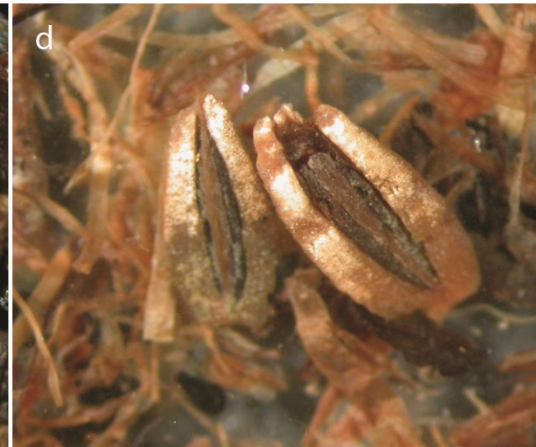
- wetland sites, pile dwellings from the 5th to the 3rd (2nd) mill. cal BC
- the beginnings of the agriculture and animal husbandry
- former lake area
- the peat was cut off

Potential for archaeobiological investigations

- new methods were applied (sampling, wet sieving, examining, identification, morphological analysis, genetics)
- new plant species were discovered
- sites were absolutely dated by dendrochronology

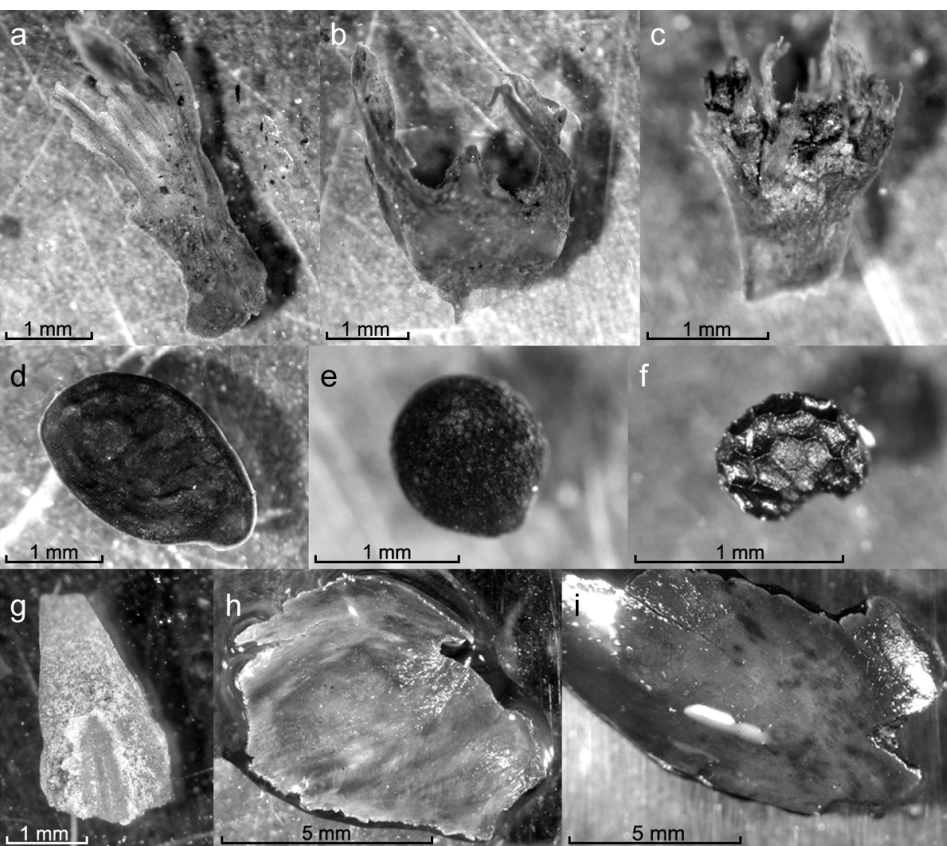
Scientific papers

- TOLAR, Tjaša, JACOMET, Stefanie, VELUŠČEK, Anton. Cereal chaff used as temper in loom-weights : new evidence from a Slovenian Eneolithic pile-dwelling site (ca. 3100 cal BC). *Vegetation history and archaeobotany*, 2016, 25/3: 291-301.
- TOLAR, Tjaša, JACOMET, Stefanie, VELUŠČEK, Anton, ČUFAR, Katarina. Plant economy at a late Neolithic lake dwelling site in Slovenia at the time of the Alpine Iceman. *Veg. hist. archaeobot.*, 2011, 20: 207-222.
- ČUFAR, Katarina, KROMER, Bernd, TOLAR, Tjaša, VELUŠČEK, Anton. Dating of 4th millennium BC pile-dwellings on Ljubljansko barje, Slovenia. *Journal of Archaeological Science*, 2010, 37: 2031-2039.
- TOLAR, Tjaša, JACOMET, Stefanie, VELUŠČEK, Anton, ČUFAR, Katarina. Recovery techniques for waterlogged archaeological sediments: a comparison of different treatment methods for samples from Neolithic lake shore settlements. *Veg. hist. archaeobot.*, 2010, 19: 53–67.
- TOLAR, Tjaša, ČUFAR, Katarina, VELUŠČEK, Anton. The wooden handle of a stone hammer-axe from the Eneolithic pile dwelling settlement Stare gmajne near Verd in the Ljubljansko barje, Slovenia (Leseno toporišče kladvaste sekire s kolišča Stare gmajne na Ljubljanskem barju). *Arheol. vestn.*, 2008, 59: 49-56.
- TOLAR, Tjaša, JAKŠE, Jernej, KOROŠEC-KORUZA, Zora. The oldest macroremains of *Vitis* from Slovenia. *Veg. hist. archaeobot.*, 2008, 17/1: 93-102.

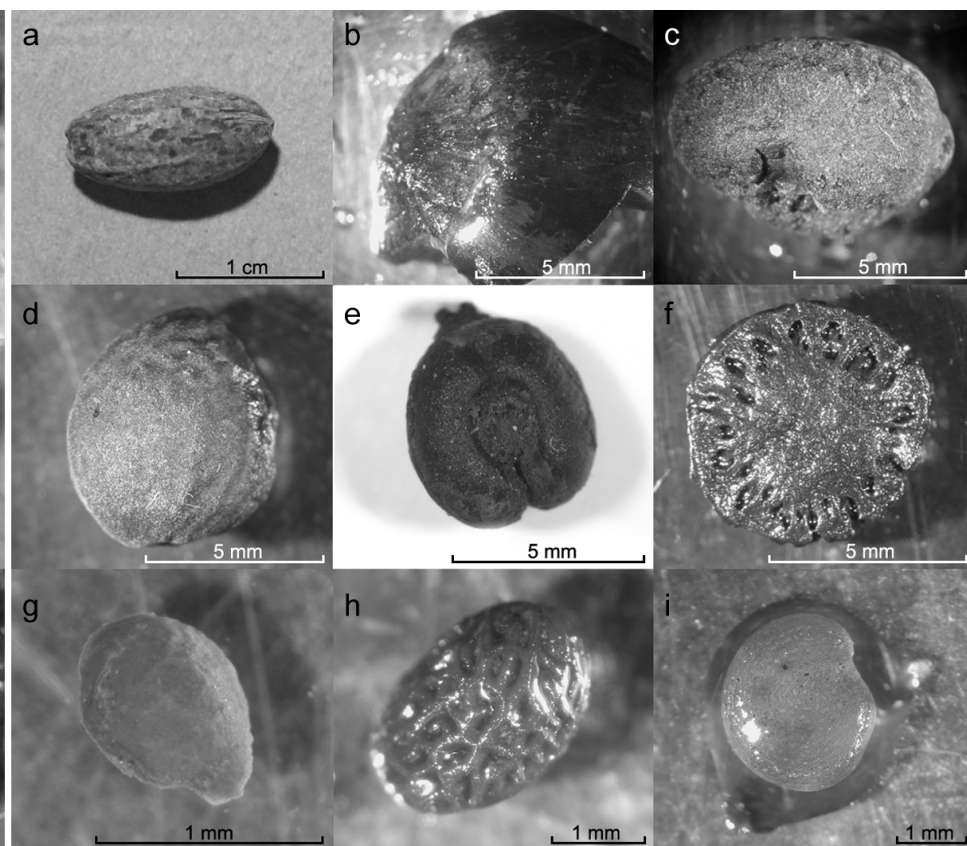


method M1

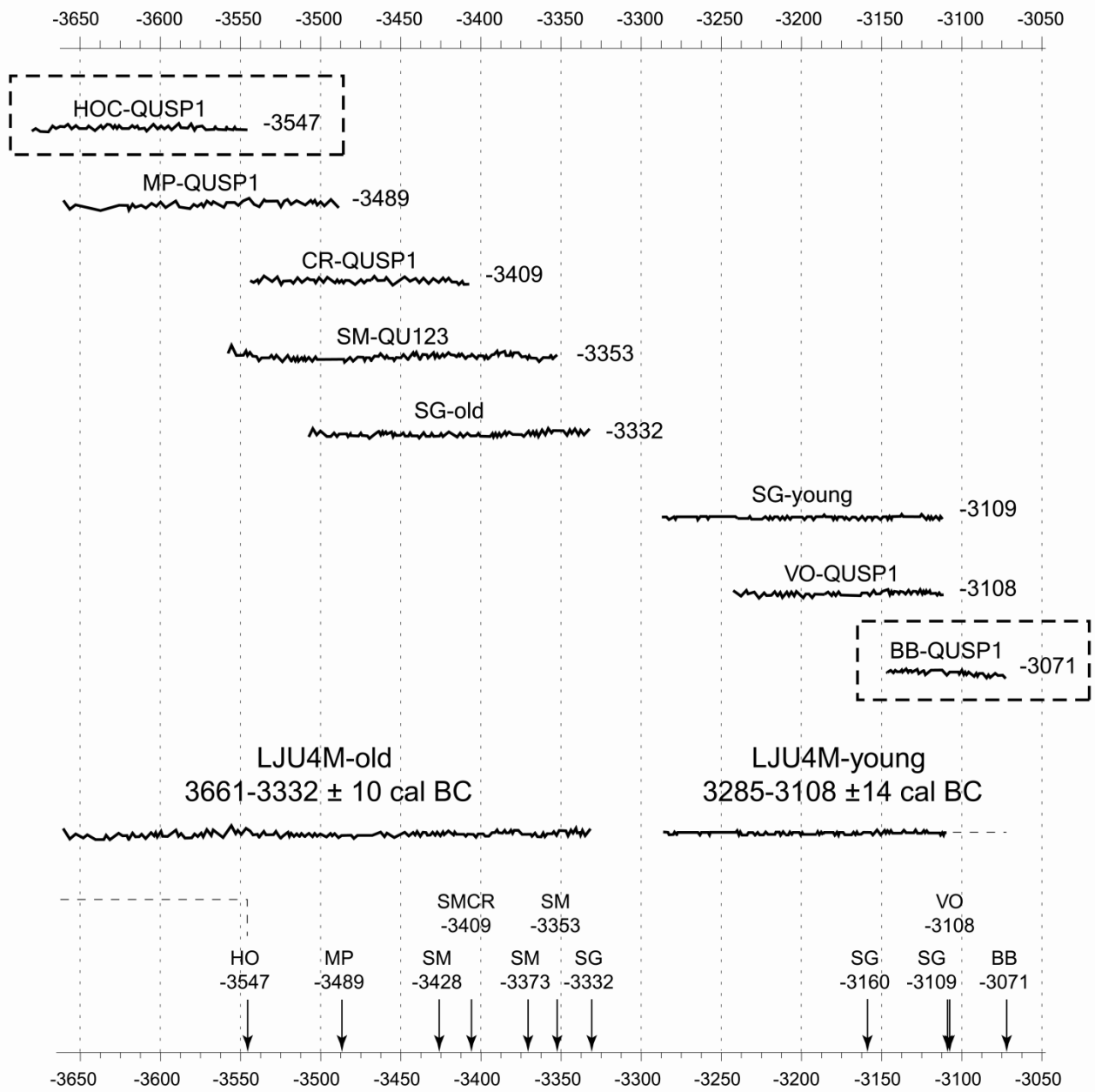
method M3



A fragile waterlogged macroremains



B hard lignified macroremains



Pile-dwelling



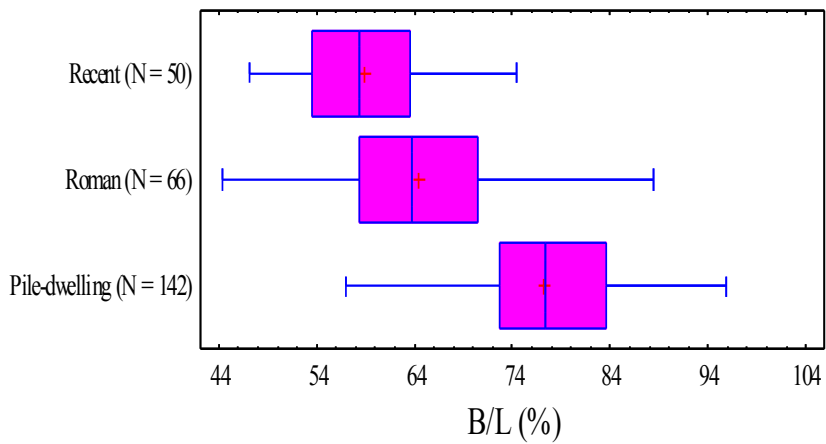
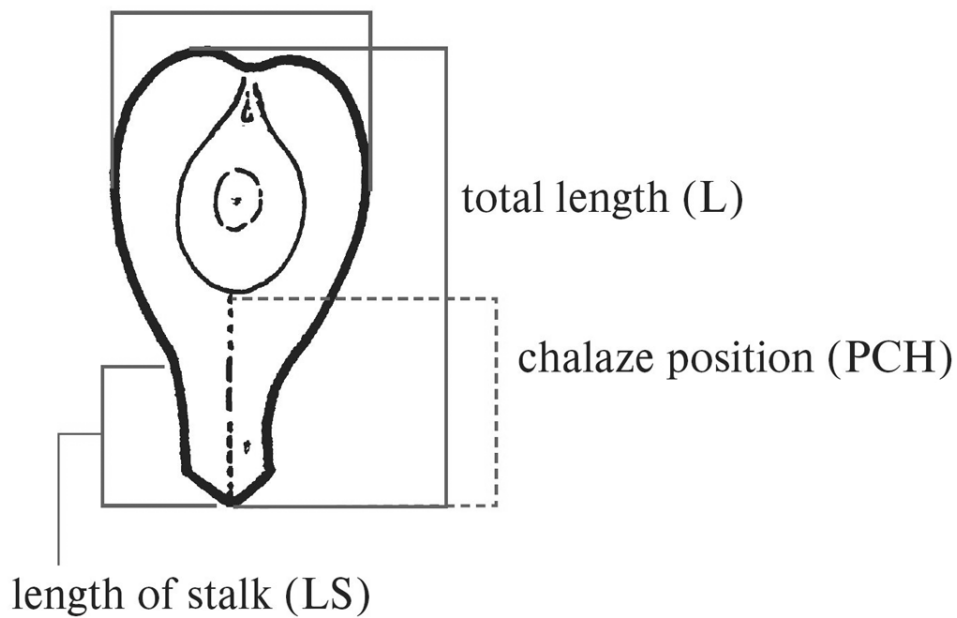
Roman



Recent



total breadth (B)





Cereal chaff used as a temper in a loam-weight: new evidence from a Slovenian Eneolithic pile-dwelling site





different spikelet forks with rachis frg. of emmer (*Triticum dicoccum*)



a) glume base; b) spikelet fork; c) rachis fragment of barley (*Hordeum vulgare*)

THANK YOU FOR
YOUR ATTENTION!

