TMP–II exercises on seriation

24 February 2023

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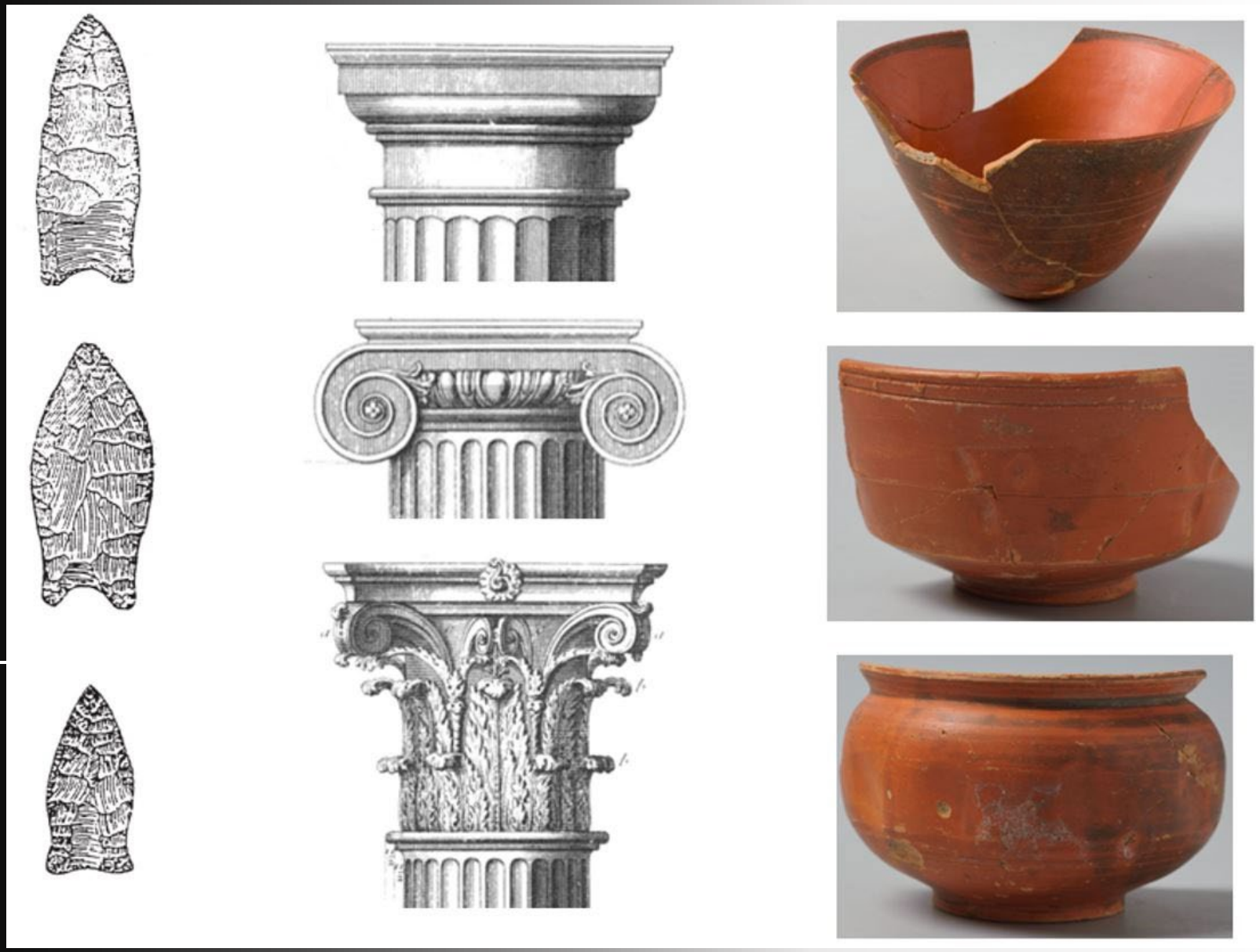
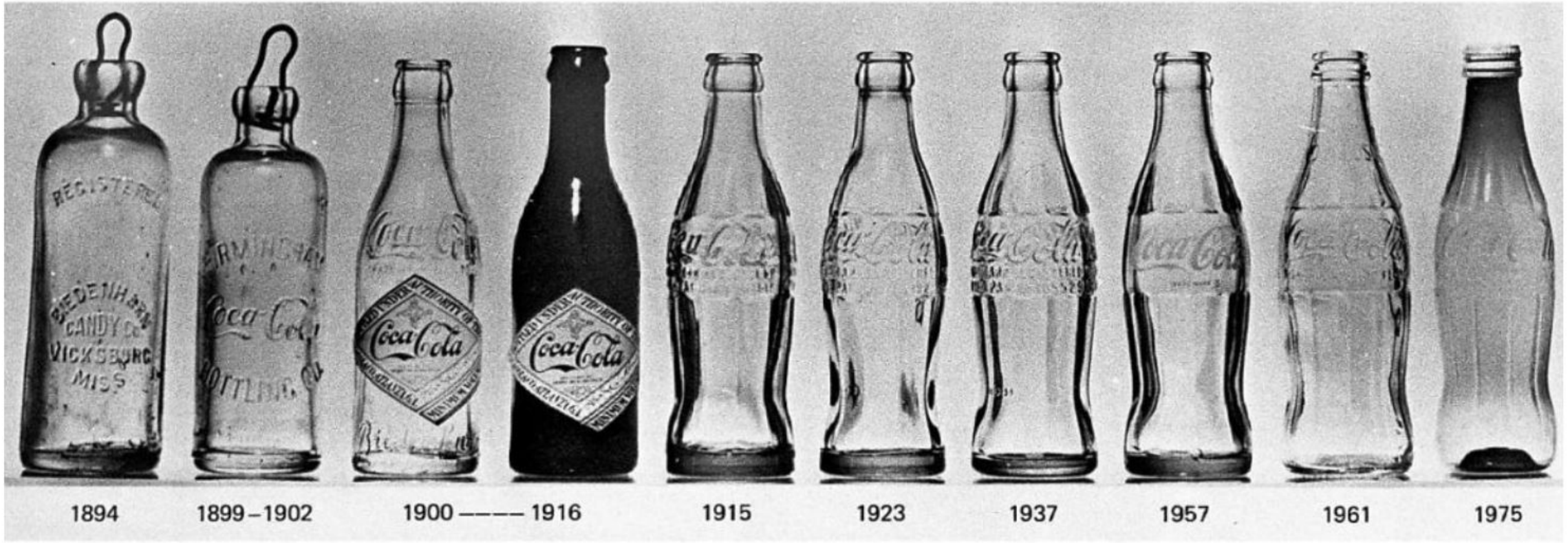


Contents and timing of today's session

- Introduction [20 minutes]
- Exercise 1 [5+20+5 minutes]
- Break [10 minutes]
- Exercise 2 [5+25+5 minutes]
- Exercise 3 [5+10 minutes]
- Conclusion [5 minutes]

The background behind the bottle

Coca-Cola's history has got over 135 years' worth of bottle.



Type-A Type-B Type-C . . . . . Type-X

Image from: https://www.wfyi.org/news/articles/western-indiana-history-center-to-feature-coke-bottle-mural

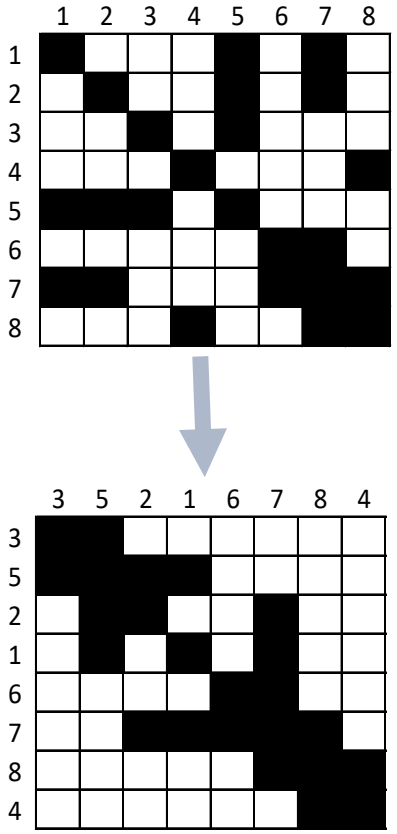
Classic BIC® Cristal has the same design since 1955…

Type-A

Image from: https://www.reddit.com/r/Damnthatsinteresting/comments/xj1xbl/the_bic_pen_bic_cristal_history/

What is Seriation?

A – B – C
A – C – B
B – A – C
B – C – A
C – A – B
C – B – A



- The broad use of seriation in other fields.

Video recording from: https://vega.github.io/vega/examples/reorderable-matrix/

Seriation in Archaeology

- Absolute *versus* Relative dating.

➲Serial order is time.

- Why useful?

➲Analytical approach:

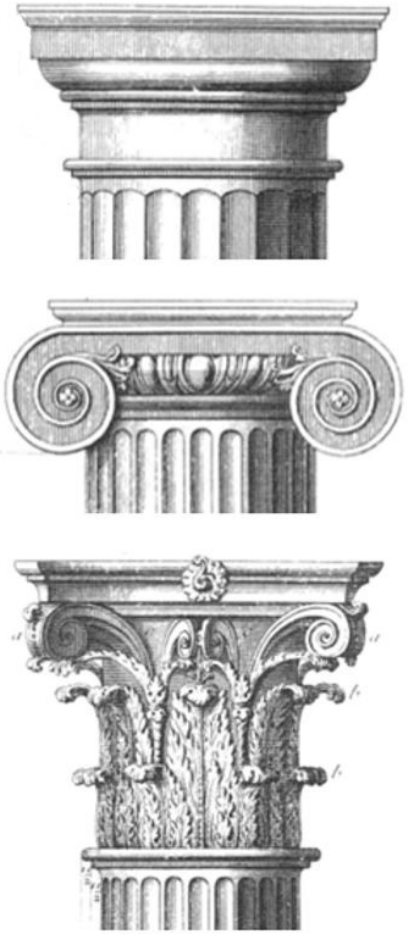
  - Occurrence (Presence)
  - Frequency (Count)

Contexts
Context – 1
Context – 2
Context – 3
Context – 4
Context – 5

Projectile points

Pottery type

Architectural style



Occurrence *versus* Frequency setting

Occurrence

Presence?

1 = YES 0 = NO

	Type – 1	Type – 2	Type – 3	Type – 4
Context – 1	**1**	**1**	0	**1**
Context – 2	**1**	0	**1**	**1**
Context – 3	**1**	**1**	**1**	**1**
Context – 4	**1**	0	0	**1**
Context – 5	0	**1**	**1**	**1**

Frequency

Count of finds.

0, 1, 2, 3, 4, …. 100, …, 1000, …

	Type – 1	Type – 2	Type – 3	Type – 4
Context – 1	**15**	**10**	0	**50**
Context – 2	**6**	0	**2**	**12**
Context – 3	**17**	**5**	**2**	**8**
Context – 4	**9**	0	0	**1**
Context – 5	0	**13**	**4**	**4**

Occurrence *versus* Frequency setting

Occurrence

Presence?

1 = YES 0 = NO

	Type – 1	Type – 2	Type – 3	Type – 4
Context – 1	**1**	**1**	0	**1**
Context – 2	**1**	0	**1**	**1**
Context – 3	**1**	**1**	**1**	**1**
Context – 4	**1**	0	0	**1**
Context – 5	0	**1**	**1**	**1**

Frequency

Count of finds.

0, 1, 2, 3, 4, …. 100, …, 1000, …

	Type – 1	Type – 2	Type – 3	Type – 4
Context – 1	**15**	**10**	0	**50**
Context – 2	**6**	0	**2**	**12**
Context – 3	**17**	**5**	**2**	**8**
Context – 4	**9**	0	0	**1**
Context – 5	0	**13**	**4**	**4**

What does it mean the type was not *observed* in the context?

Occurrence *versus* Frequency setting

Occurrence

1 = YES 0 = NO

	Type – 1	Type – 2	Type – 3	Type – 4
Context – 1	**1**	**1**	0	**1**
Context – 2	**1**	0	**1**	**1**
Context – 3	**1**	**1**	**1**	**1**
Context – 4	**1**	0	0	**1**
Context – 5	0	**1**	**1**	**1**

Frequency

Count, which is transformed in %.

	Type – 1	Type – 2	Type – 3	Type – 4
Context – 1	**15**	**10**	0	**50**
Context – 2	**6**	0	**2**	**12**
Context – 3	**17**	**5**	**2**	**8**
Context – 4	**9**	0	0	**1**
Context – 5	0	**13**	**4**	**4**

	Type – 1	Type – 2	Type – 3	Type – 4
Context – 1	**20**	**13**	0	**67**
Context – 2	**30**	0	**10**	**60**
Context – 3	**53**	**16**	**6**	**25**
Context – 4	**90**	0	0	**10**
Context – 5	0	**62**	**19**	**19**

$$\frac{6}{6+0+2+12} = \frac{6}{20} = 0.3 = 30\%$$

Occurrence

Concentration principle

Incidence plot

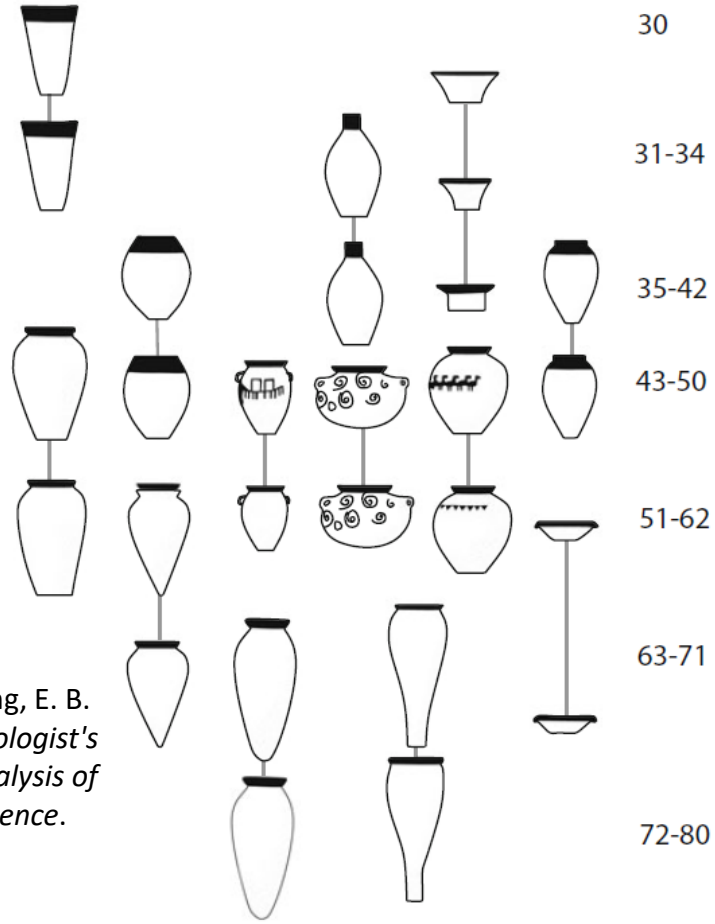


Figure from: Banning, E. B. (2020). *The Archaeologist's Laboratory: The Analysis of Archaeological Evidence*. Springer Nature.

Frequency

Kendall model: growth – peak – decline

Battleship curve

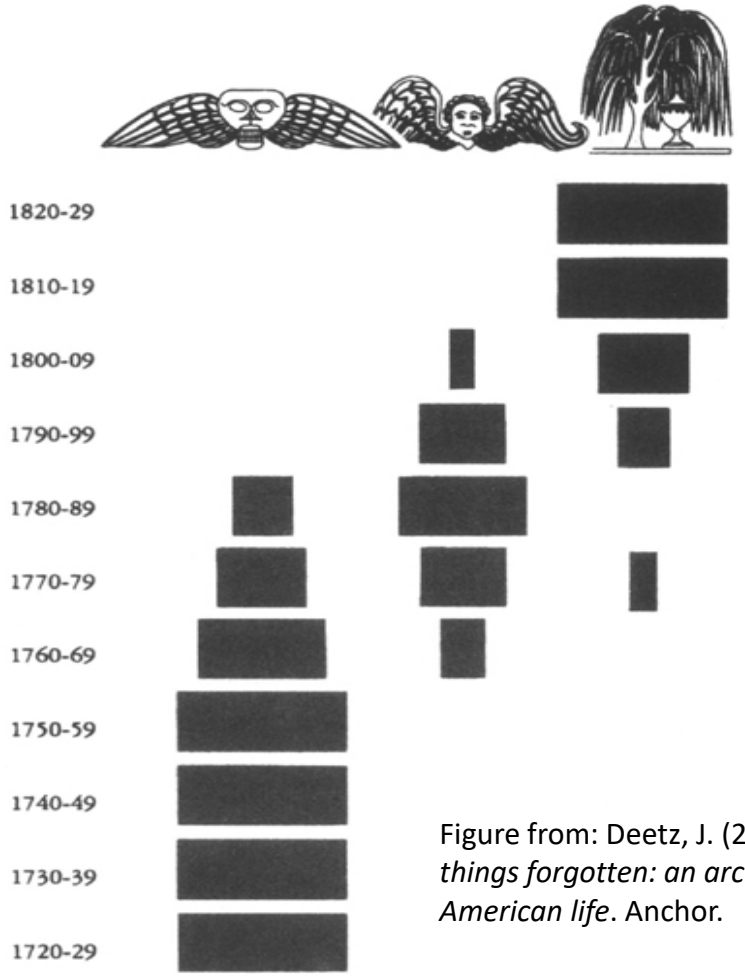
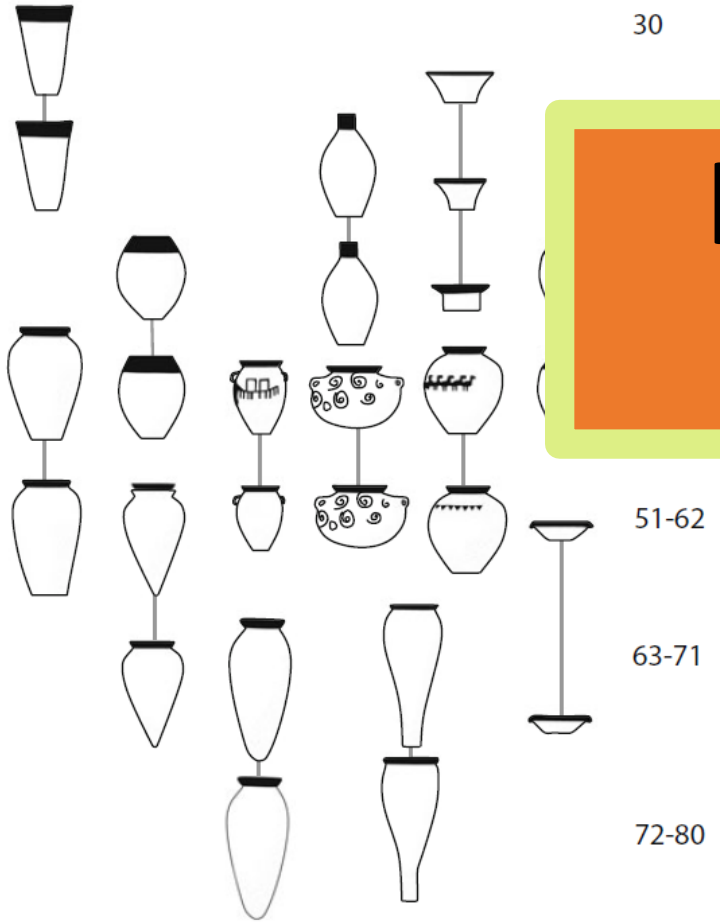


Figure from: Deetz, J. (2010). *In small things forgotten: an archaeology of early American life*. Anchor.

Occurrence

Concentration principle

Incidence plot



Imperfect data

Frequency

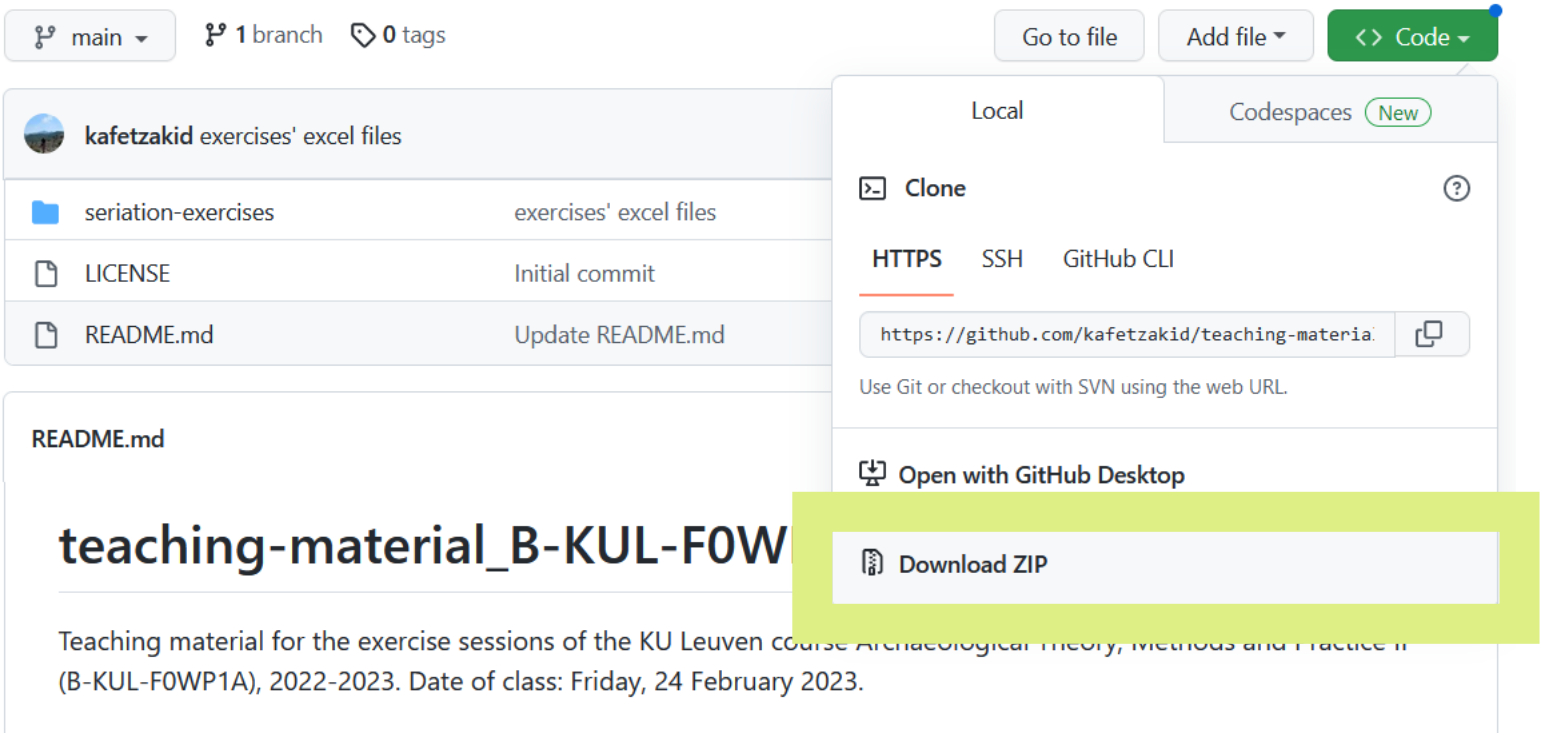
Kendall model: growth – peak – decline

Battleship curve

Are there any questions?

Next: Exercises.
Link to the files:

https://github.com/kafetzakid/teaching-material_B-KUL-F0WP1A



- Who thinks of themselves as bad with numbers?
  - Double coding: numbering and colouring.
  - Excel files including functions.

Exercise 1: Occurrence seriation

Exercise 1: Occurrence seriation

Was the type found in the context?

1 = YES 0 = NO

Encoding considers important whether the type belongs to the context or not.

- Normally, you will need to perform many iterations on providing a sequence for types and for contexts until you find the right one.
- The beginning is difficult but the end is easy.

→ Go to file: ex-1_occurrence-seriation.xlsx

Tips to solve Exercise 1

1. Rearrange types such that the types that largely co-occur are next to each other. Make two groups of types. Do not expect a perfect solution. When you have arranged the contexts you can work again on the sequence of the types.
2. Contexts that have types from both groups will be close to a transition.
3. Contexts with only one type observed will be at the end or transitional period.
4. Contexts with the same collection are contemporaneous and therefore next to each other.
5. Make use of the concentration principle and complete each type.
6. After including all contexts at the table, check whether the sequence of types should change. A type which starts before another, is earlier.

→ Go to file: ex-1_occurrence-seriation.xlsx

Exercise 2: Frequency seriation

Frequency seriation

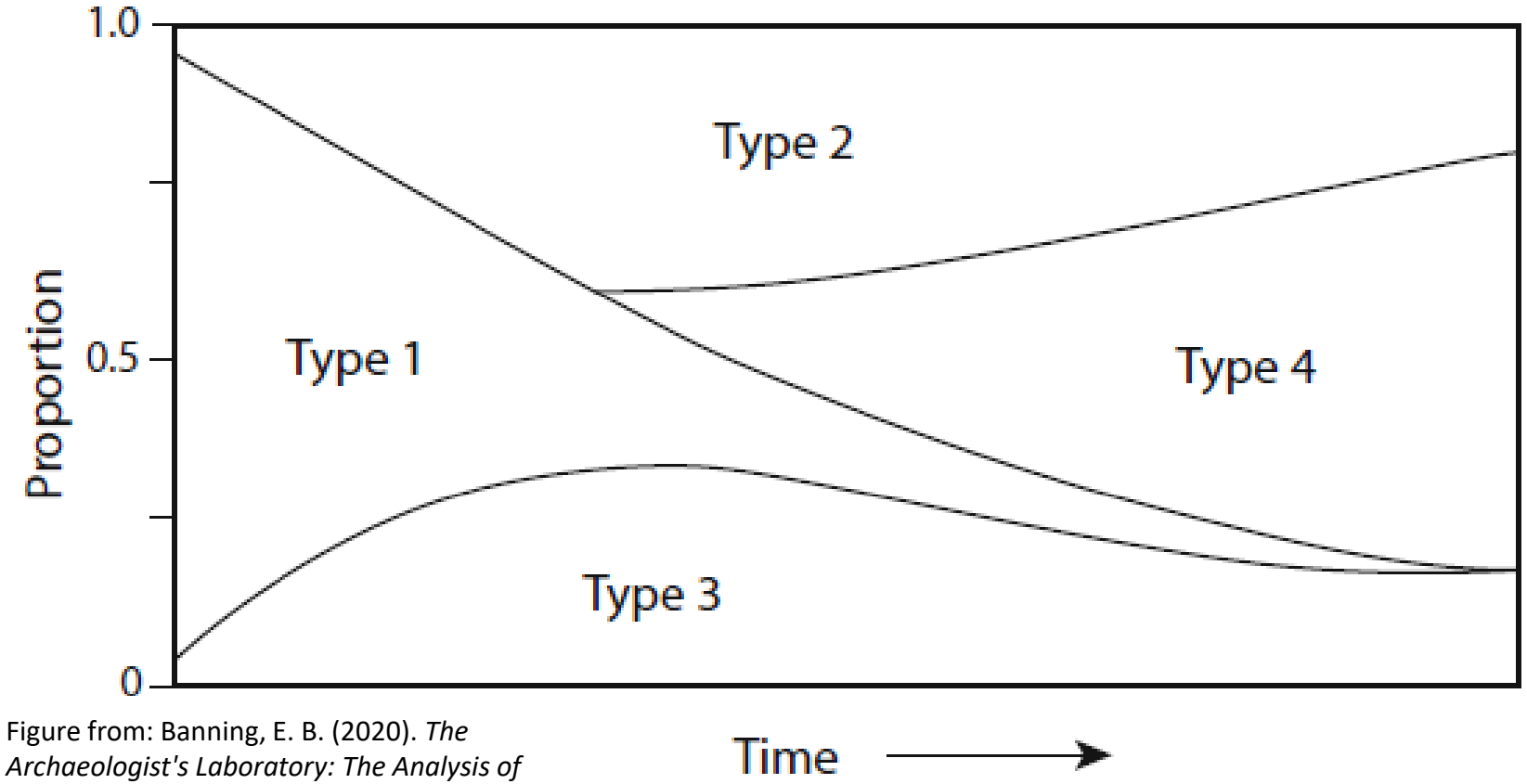
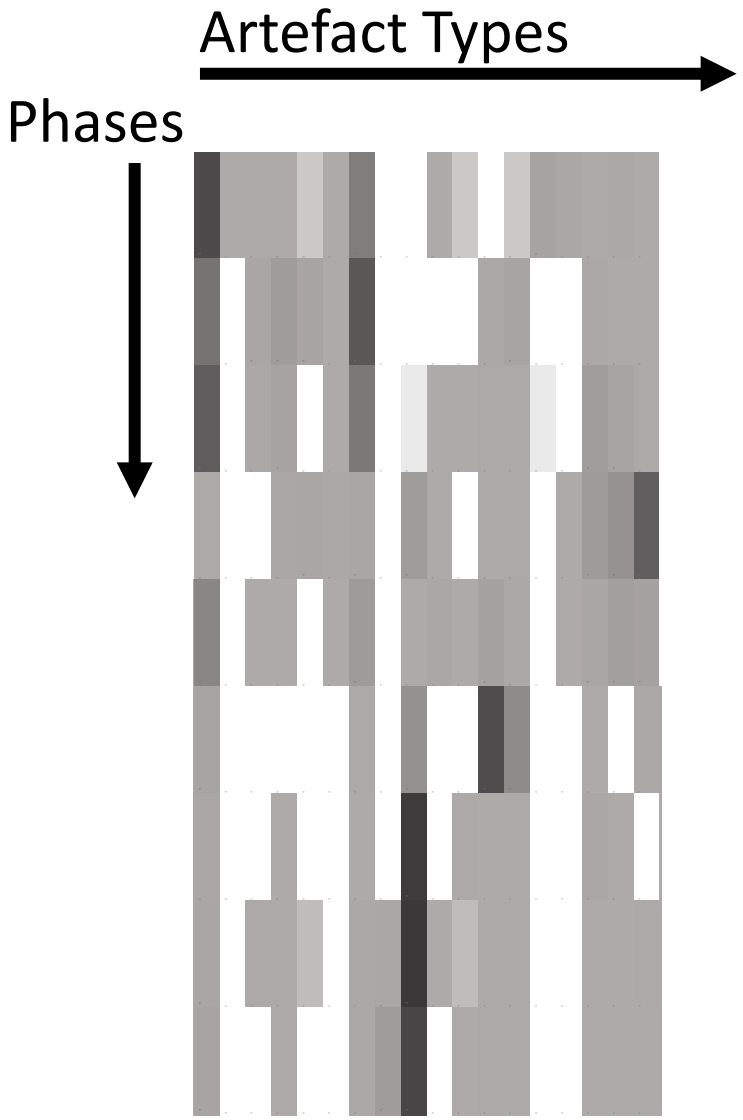


Figure from: Banning, E. B. (2020). *The Archaeologist's Laboratory: The Analysis of Archaeological Evidence*. Springer Nature.



→ Go to file: ex-2_frequency-seriation.xlsx

Tips to solve Exercise 2

1. Rearrange types such that the types that largely co-occur are next to each other. After looking at co-occurrence, take into account the values as well. Make two groups of types.
2. Look at the 'popularity' of type. There are types whose peaks reach smaller values compared to other types.
3. Contexts that have types from both groups will be close to a transition.
4. Contexts with only one type observed will be at the end or transitional period.
5. Per type, bring the contexts with high values next to each other.
6. Contexts with similar collection are close in time and therefore next to each other.
7. Make use of the continuity principle and complete each type.
8. After completing all contexts' sequence, apply changes in the sequence of types such that they follow a(n) (in)complete growth-peak decline pattern.

→ Go to file: ex-2_frequency-seriation.xlsx

Exercise 2 – extra: Battleship Curve

1. Delete % data for contexts 16 and above for all types (since for this exercise you only have data for 15 contexts).
2. Copy the type percentages from exercise 2, and paste **values** to the highlighted cells.
3. Take a snippet of the battleship curve and save it as image in your computer.

After you copy, go to the cell you want to paste, right-click, select *paste special* then select *paste values*.

→ Go to file: ex-2-extra_battleship curve.xlsx

Which seriation case did you like more?

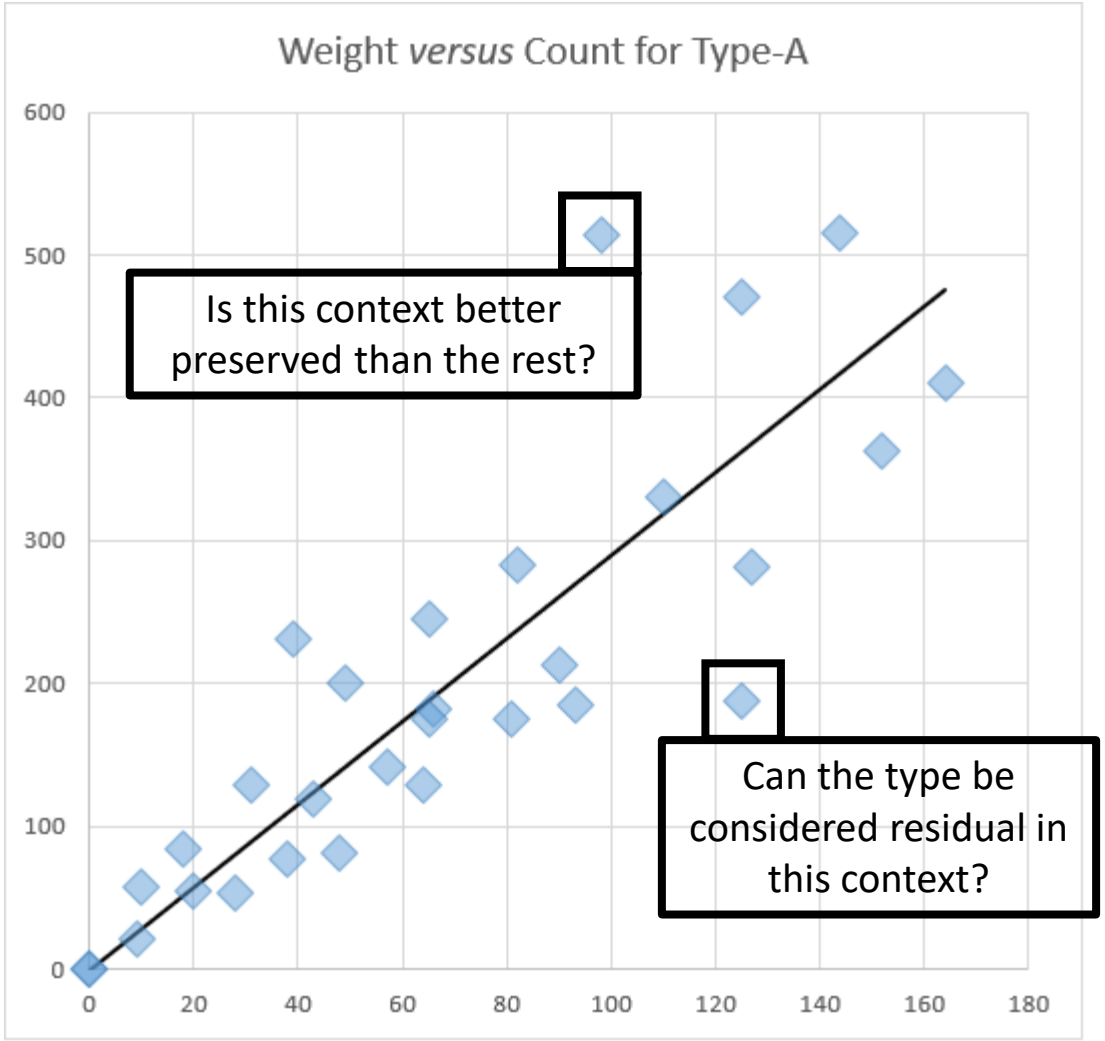
https://poll-maker.com/QEW7ZNU72

Exercise 3:
Count weight analysis

→ Go to file: ex-3_count-weight-analysis.xlsx

Analytical approach implemented in Exercise 3

1. List the count and weight for the finds of ***one type***, per context.
2. Plot the weight *versus* the count, for each context.
3. Calculate the total average ratio $\frac{Weight}{Count}$.
4. Plot a line representing the total average ratio.
5. Calculate the difference from the total average ratio for each context. Calculate the % difference.
6. Do the same for the difference from the expected weight.
7. Reconsider for the contexts with large (+/-) % difference.



→ Go to file: ex-3_count-weight-analysis.xlsx

Overall concluding remarks

- Seriation is a demanding analytical process.
- Data is not perfect.
- Use the excel functions for your project.
- Be ready to change your mind several times.
- If the data is too much, focus on subsets.

Wish you good luck with your Opdracht and your Studies.

Enjoy your Friday evening!

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