

The Predicate Form:

*using artifact shapes to reconstruct
prehistoric social interactions*

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How do we understand *cultural* change
through time and space?

How do we understand *artifact* change
through time and space?

What do these changes tell us about
human organization and behavior?

A central problem in archaeology is how & why did cultures evolve
(which means: *how do we explain the temporal and spatial patterns?*)

Reactions or adaptations to environmental changes

Population pressures

Interaction (trade, conflict)

Population movement

Diffusion

Southeastern North America

Late Pleistocene – Early Holocene Epochs
Late Paleoindian – Early Archaic Periods

~12,000 – 10,500 years ago

Drier than modern times
Sea level lower
Modern fauna



11,700 cal yr BP



Dalton

Side Notched

Quad

Suwannee/
Simpson

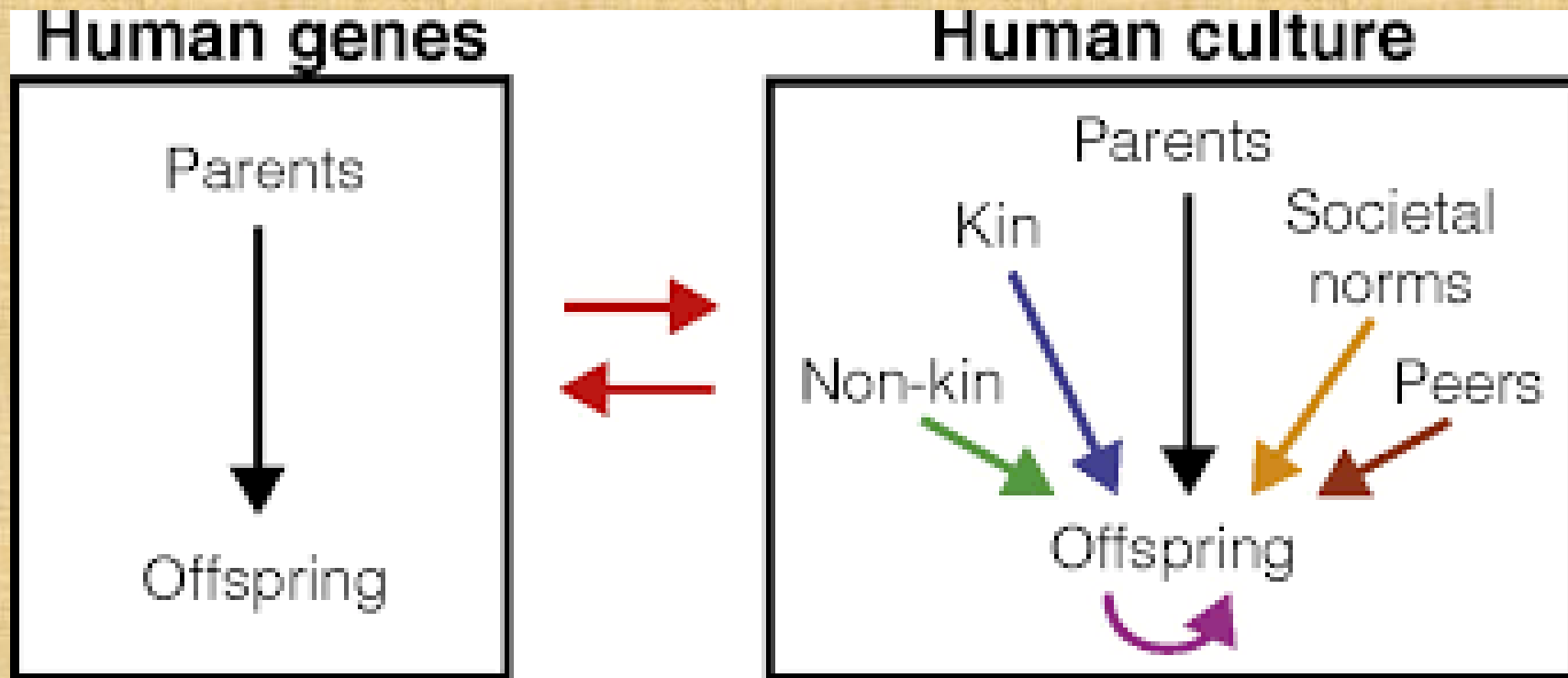
~11,700 BP



~11,500 BP



Dual Inheritance Theory



Parallels between genetic and cultural processes

Gene

Unit of cultural information

Gene pool

Culture pool

Genetic inheritance

Cultural transmission

Natural selection

Cultural selection

Mutation

Innovation

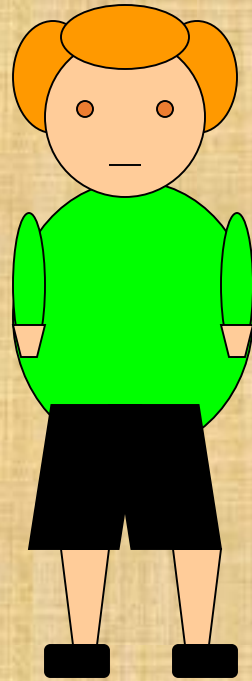
Random genetic drift

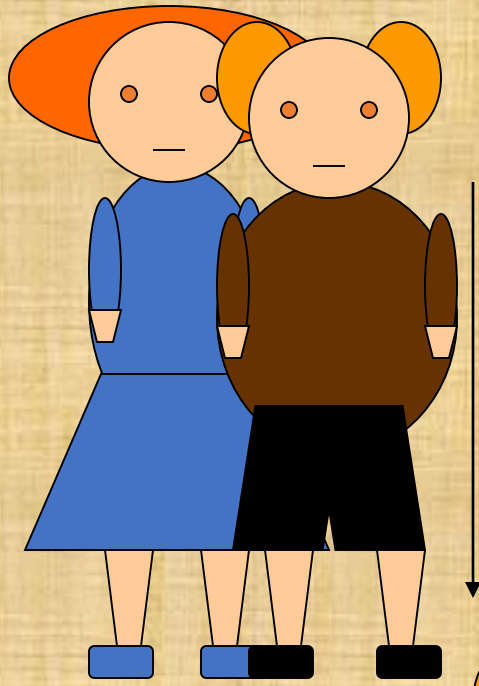
Random cultural drift

Error in transmission

Error in learning or teaching

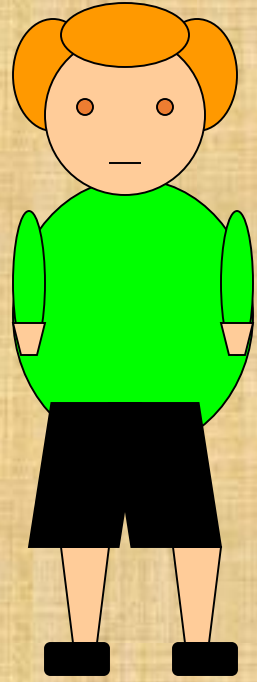
How is information transmitted?

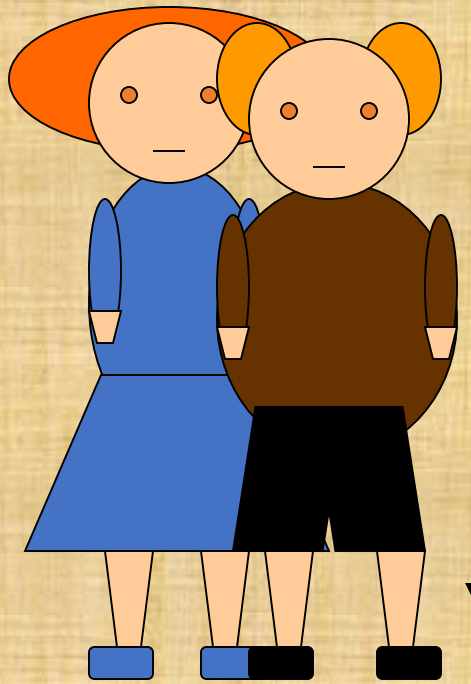




Parents

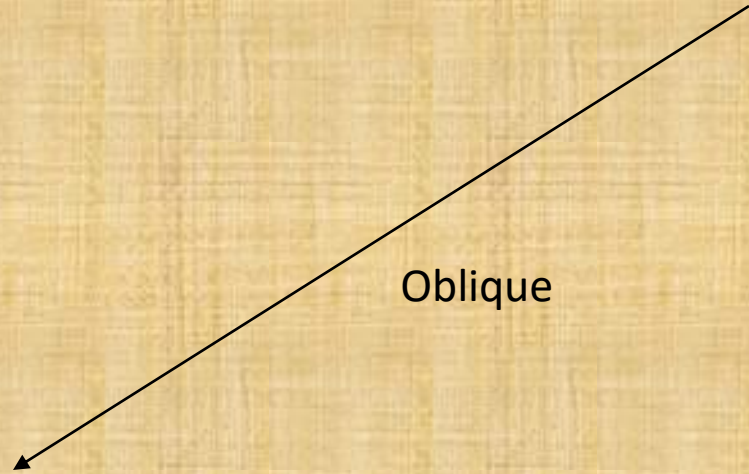
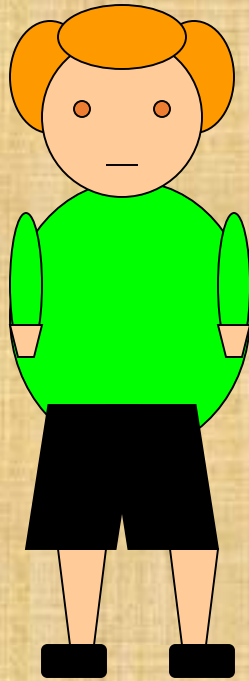
Vertical



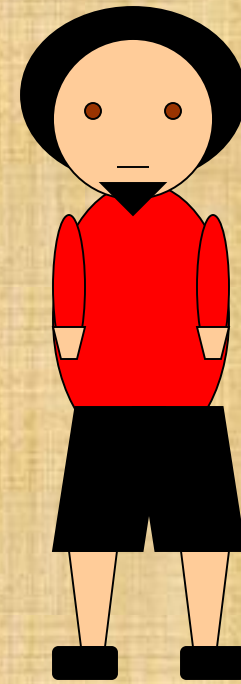


Vertical

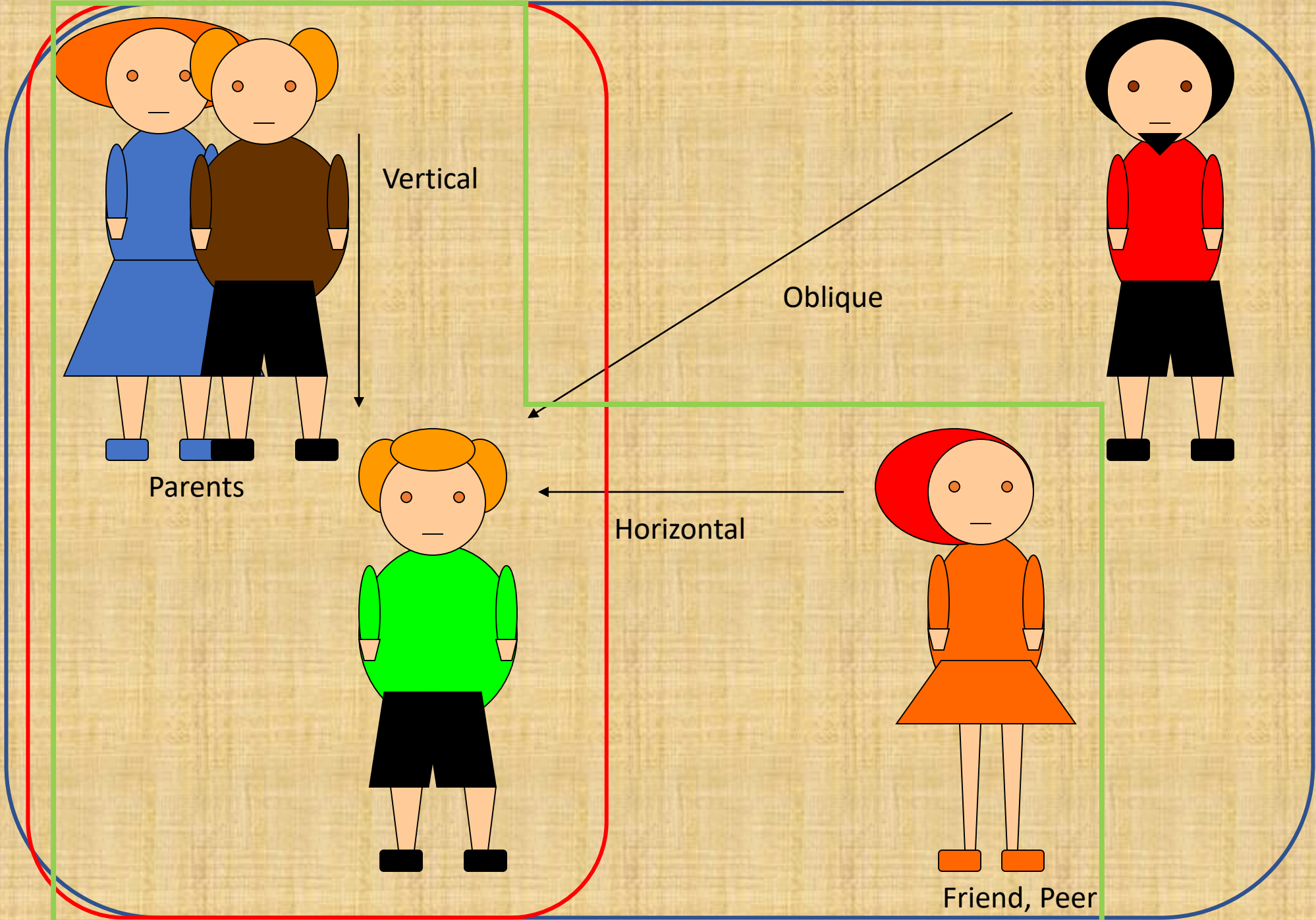
Parents

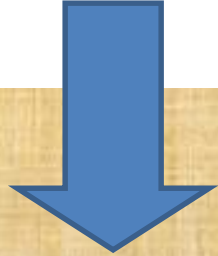


Oblique

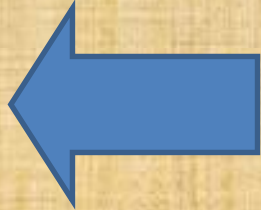
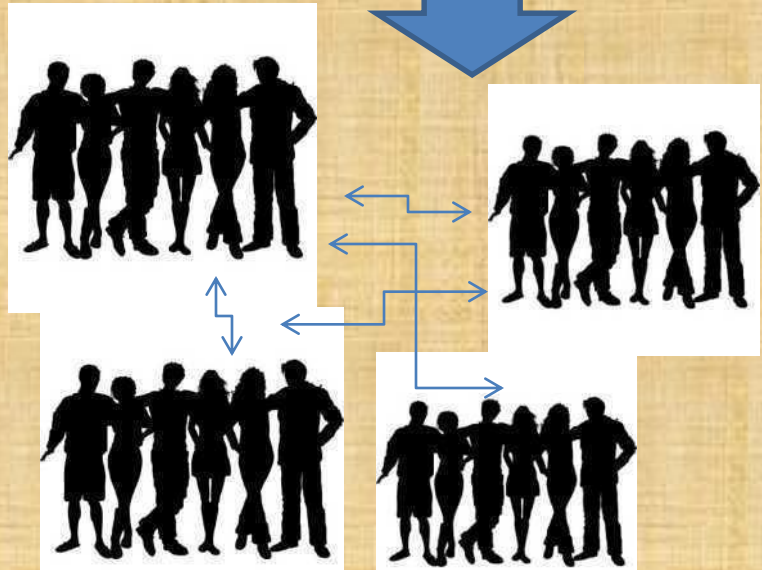


Teacher, Leader, Elder, Aunt, Relative

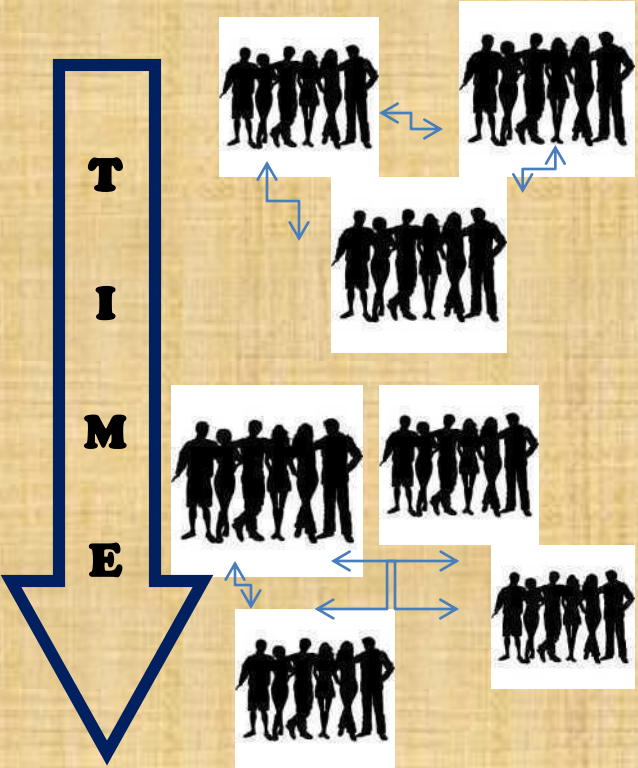




SPACE



T
I
M
E



First Principles

Made by people

**People learn to make things by instruction or imitation:
*from others in earlier and later generations from peers***

How do they choose what to make?

Groups of learners tend to arrive at a single shared design

Biased Transmission

Shared design is conservatively preserved through time

How does Ego decide what to do?

Experiment

Take advice: but from whom?

1. Most successful
2. What most people are doing

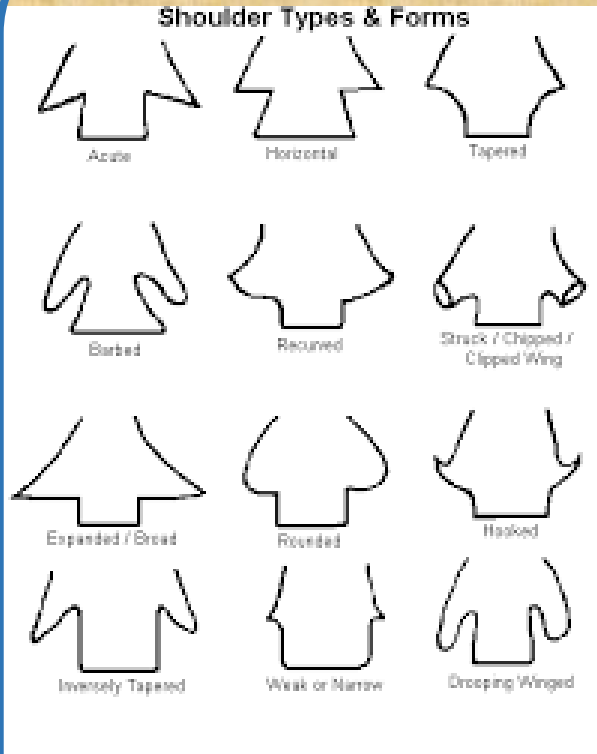


Bolen points

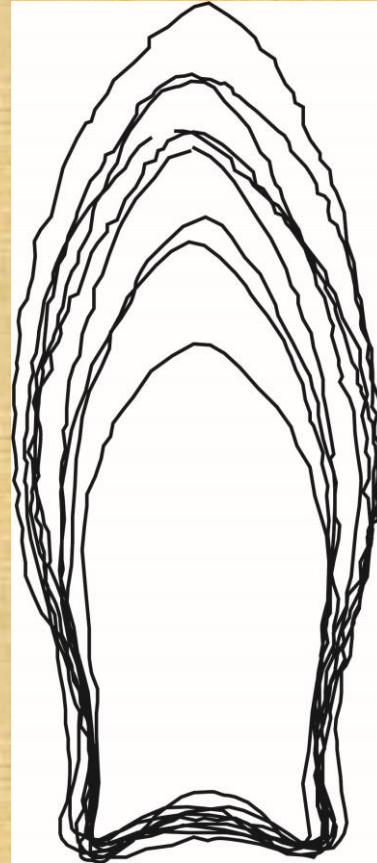
Made ~11,500 B.P.

North Florida

What do we measure?



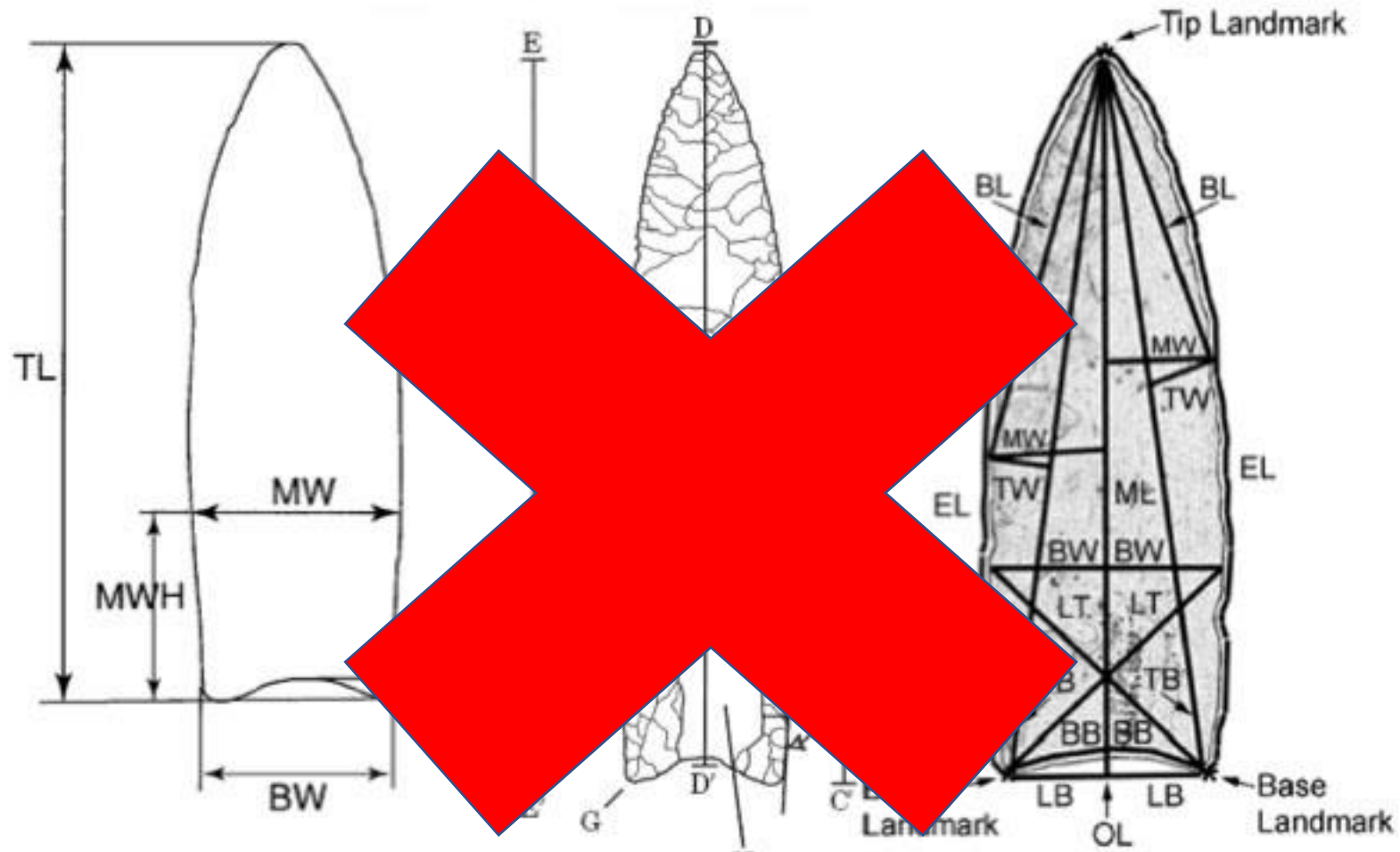
Shape



Use



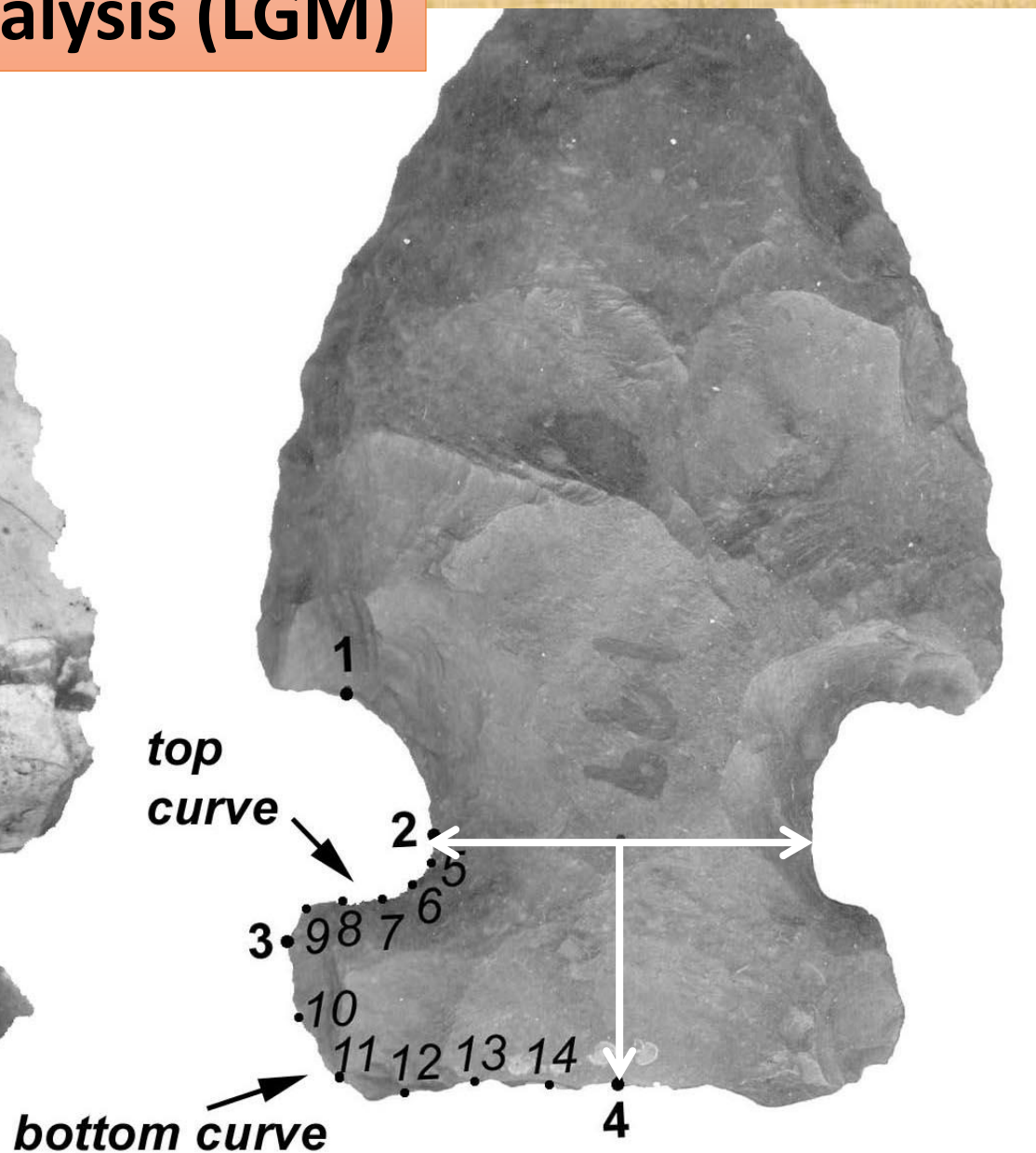
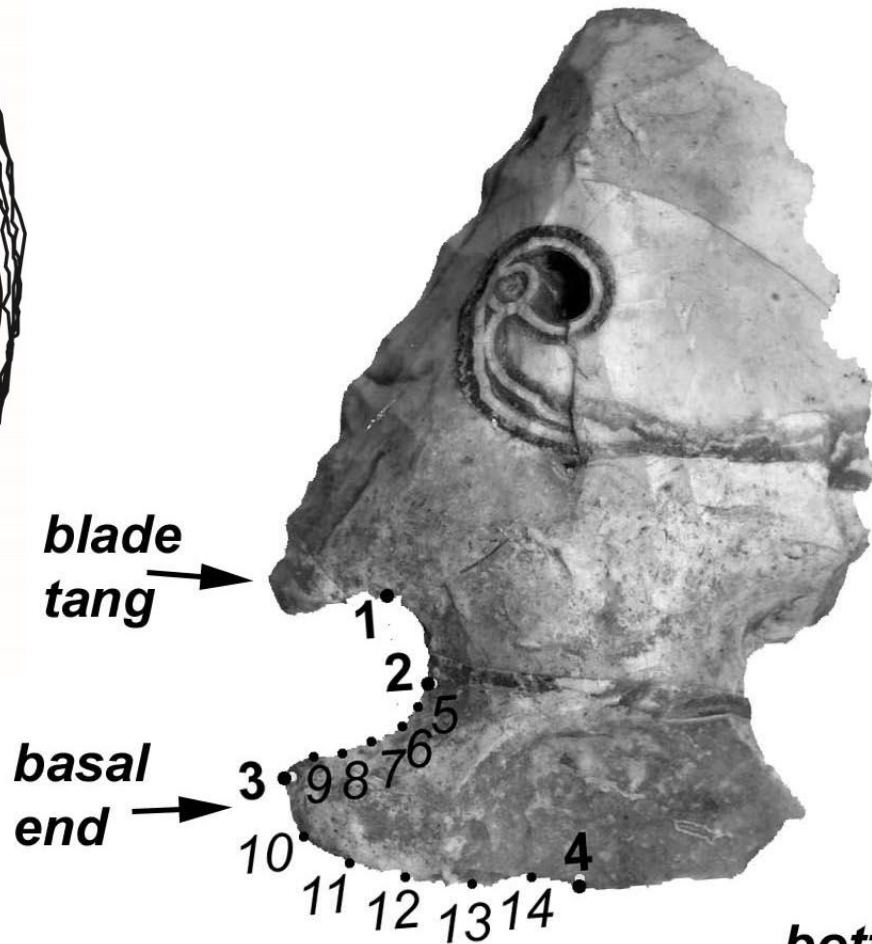
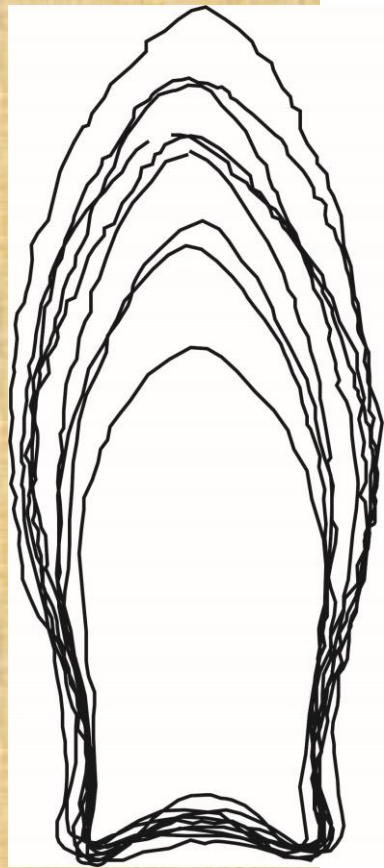
Manufacture



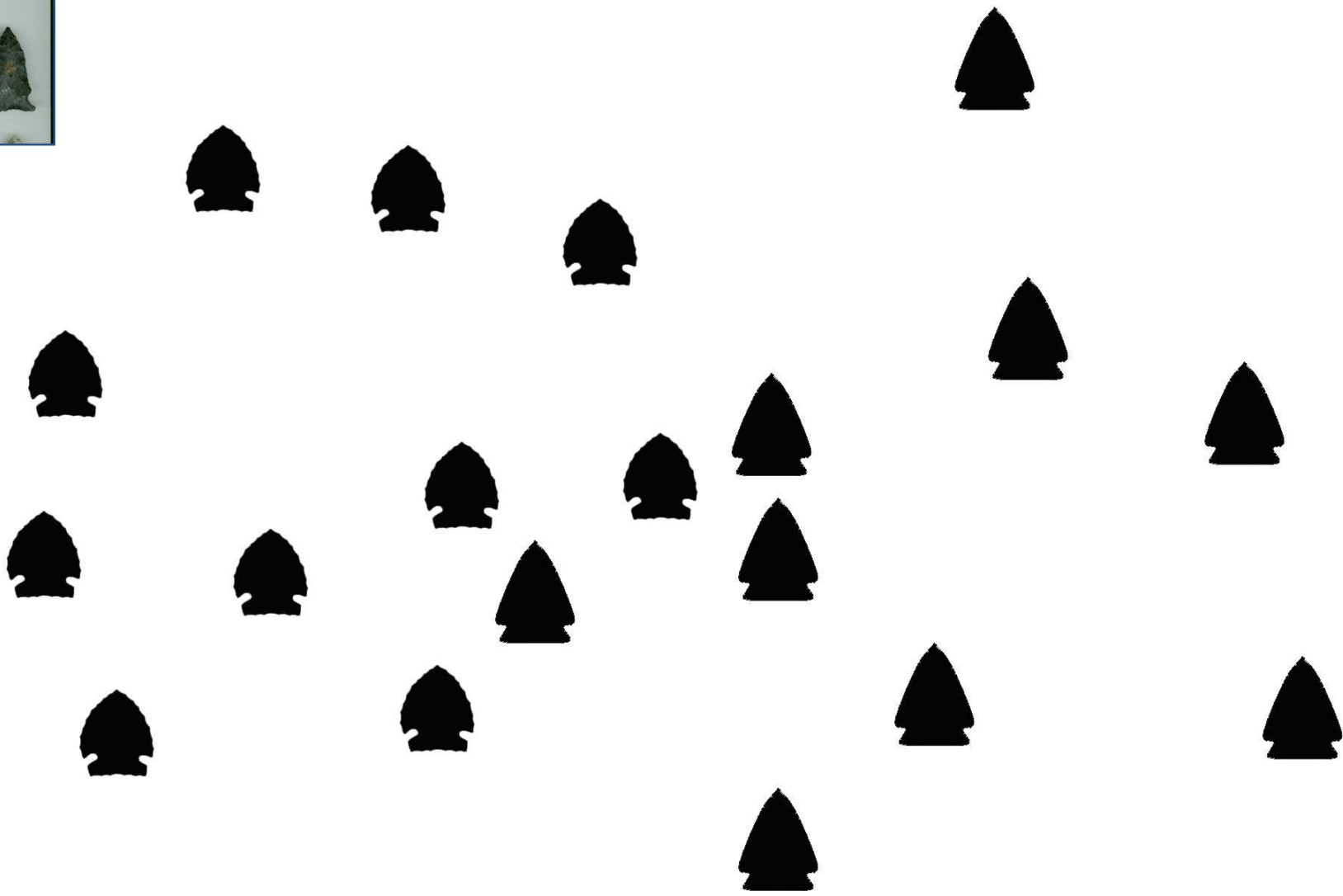
(Morrow & Morrow 1999) (O'Brien et al. 2001) (Buchanan & Collard 2007)

Landmark Placement for Landmark Geometric Morphometric Analysis (LGM)

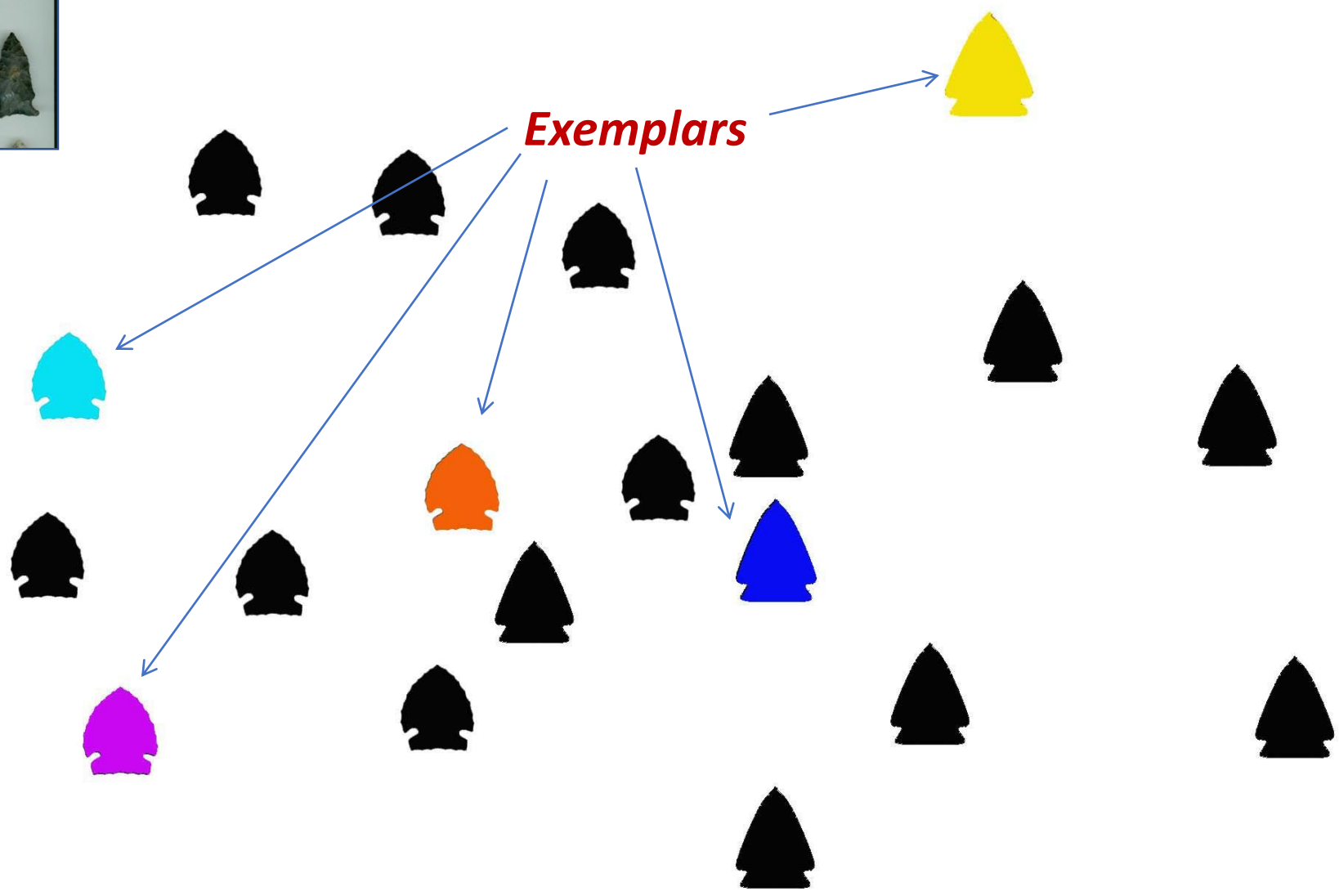
*4 main Landmarks (1-4)
2 curves (5-9 and 10-14)*



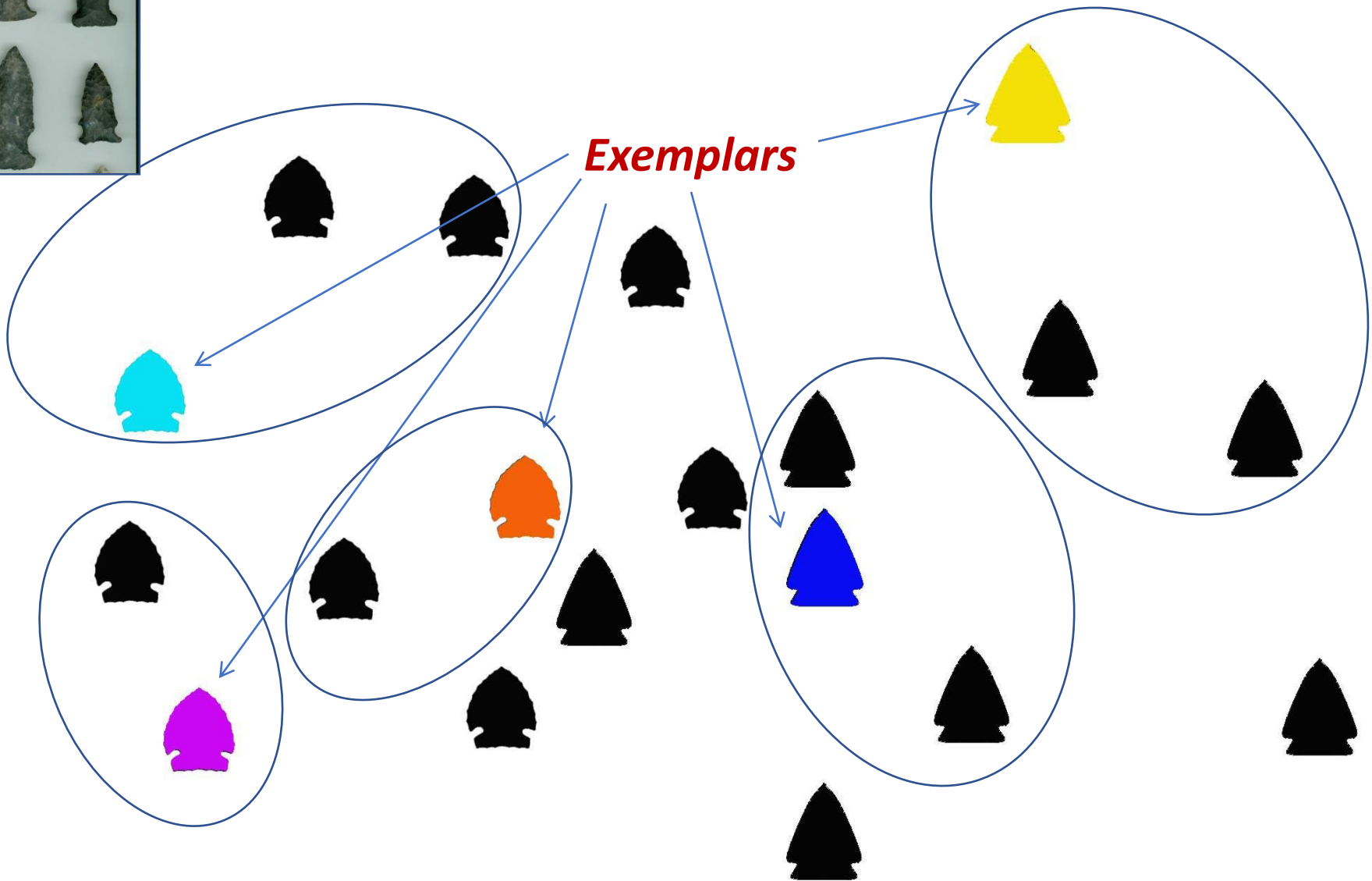
Creating Typologies Using Exemplars



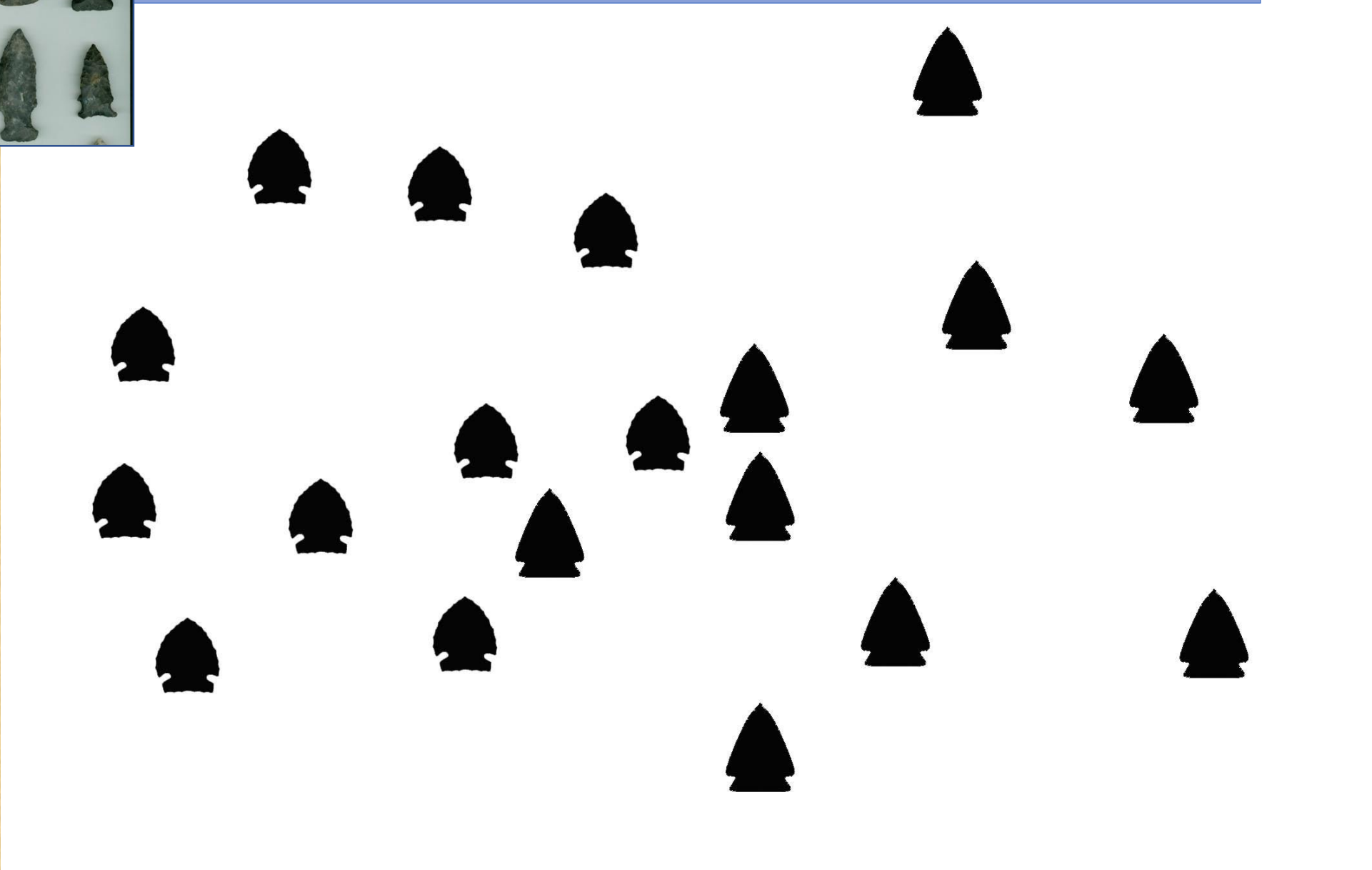
Creating Typologies Using Exemplars



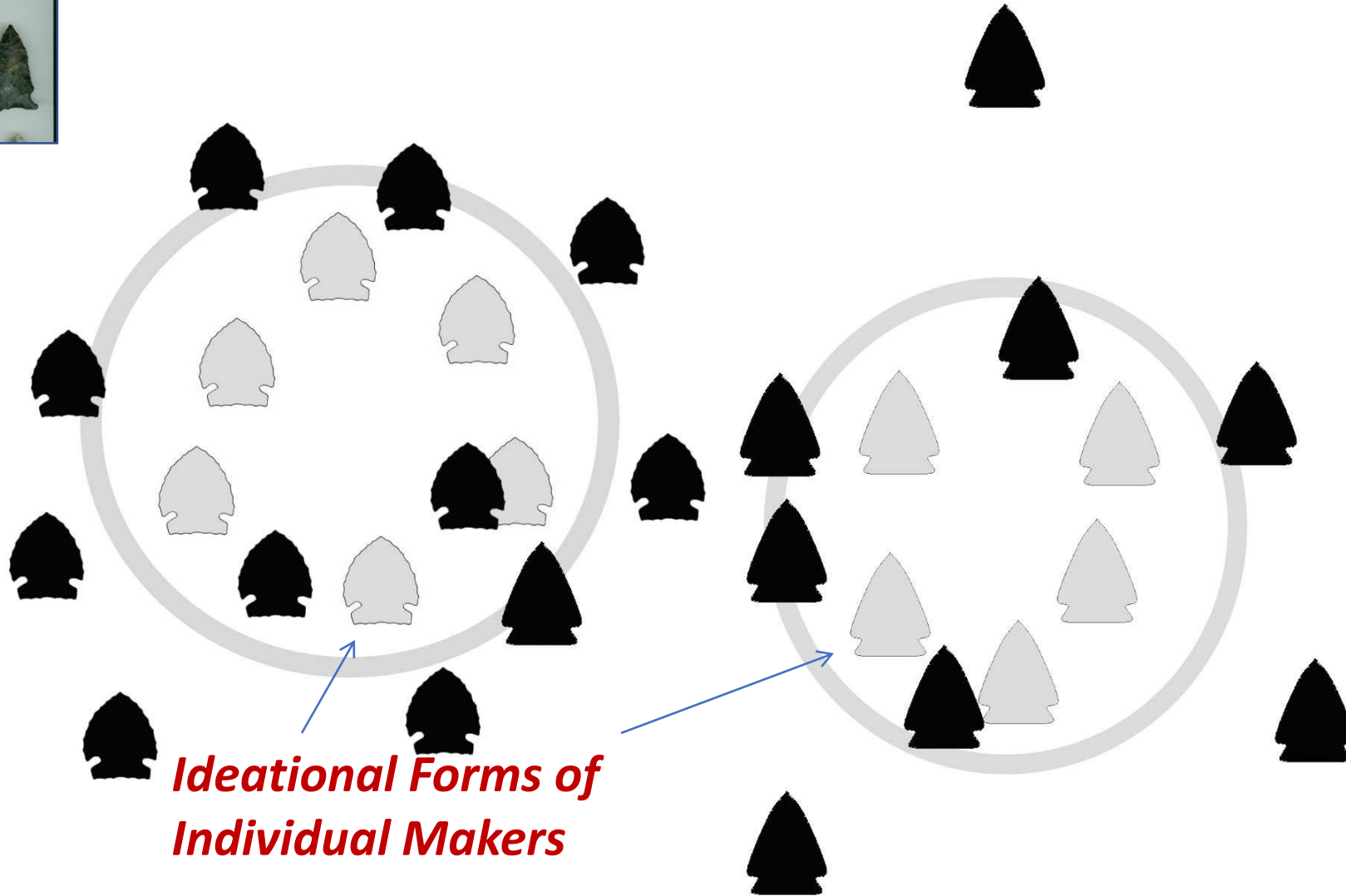
Creating Typologies Using Exemplars



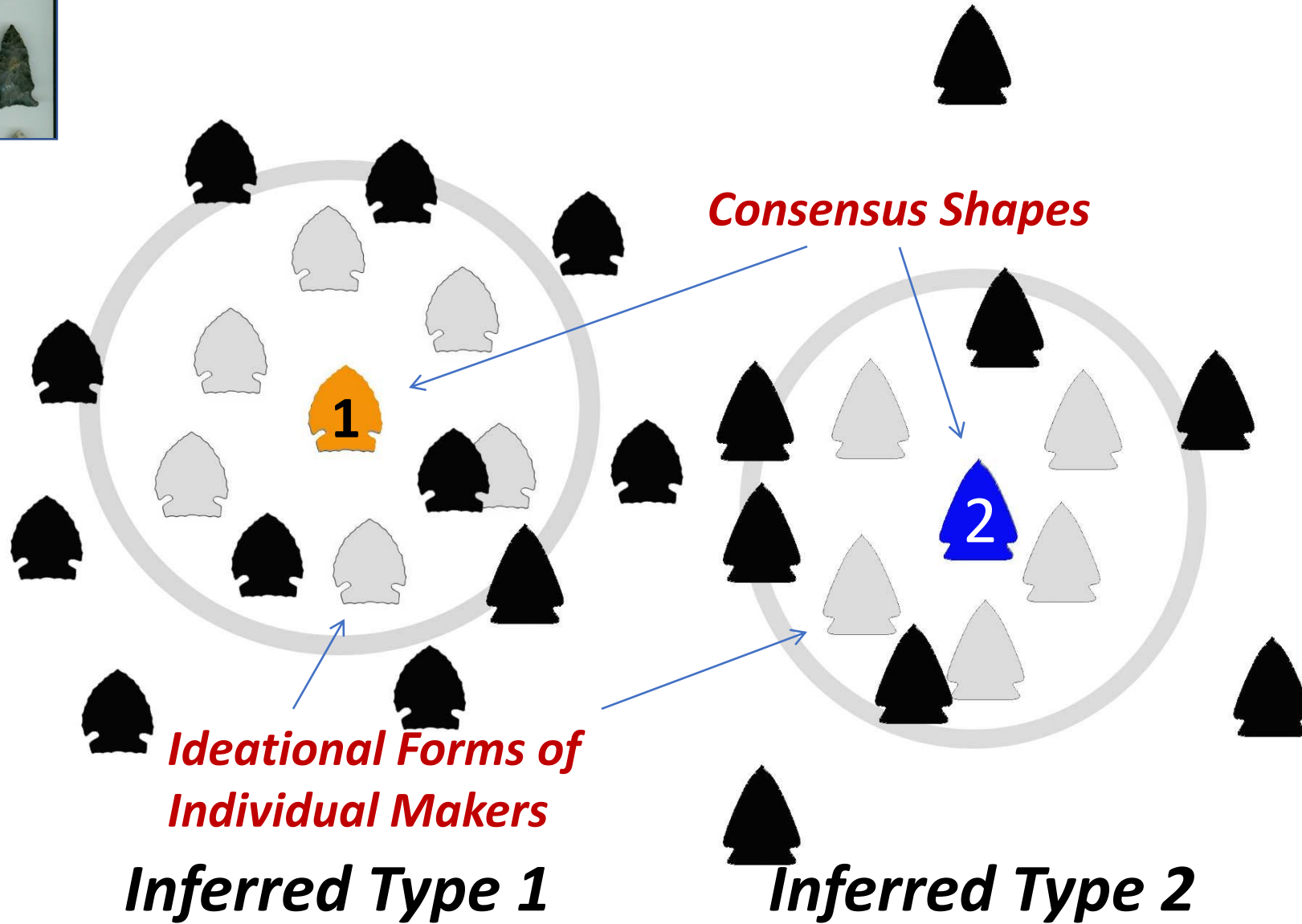
Identifying SLGs Using Learning Theory and Considering all Artifact Shape Variation

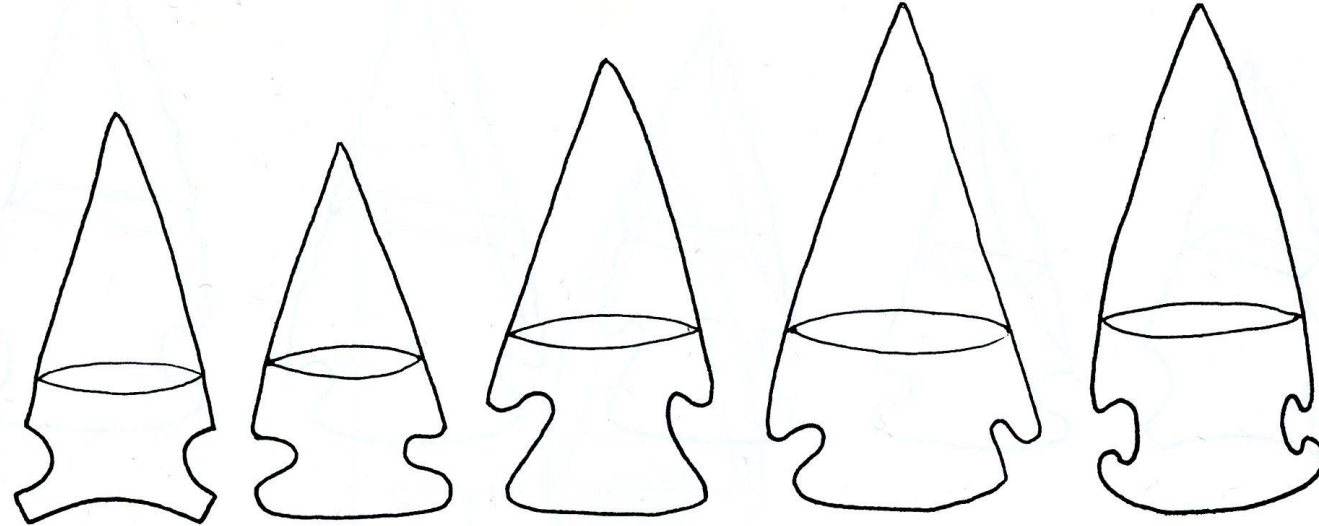


Creating Typologies Using Learning Theory and Considering all Variation

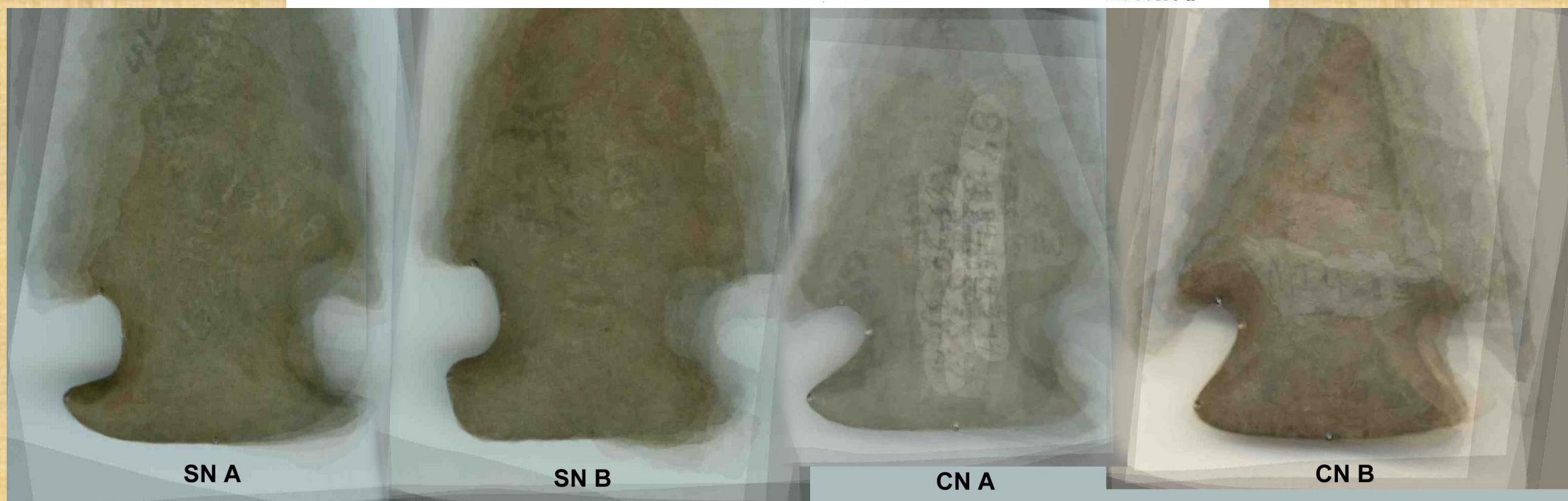


Creating Typologies Using Learning Theory and LGM





Subtypes: 1 2 3 4 5
Concave based Side notched High notched Corner notched Expanded
notched



SN A

SN B

CN A

CN B



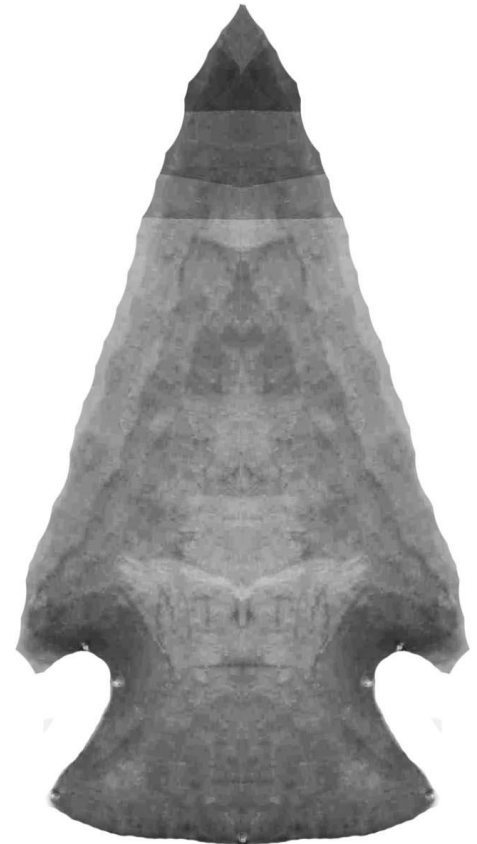
SNA



SNB

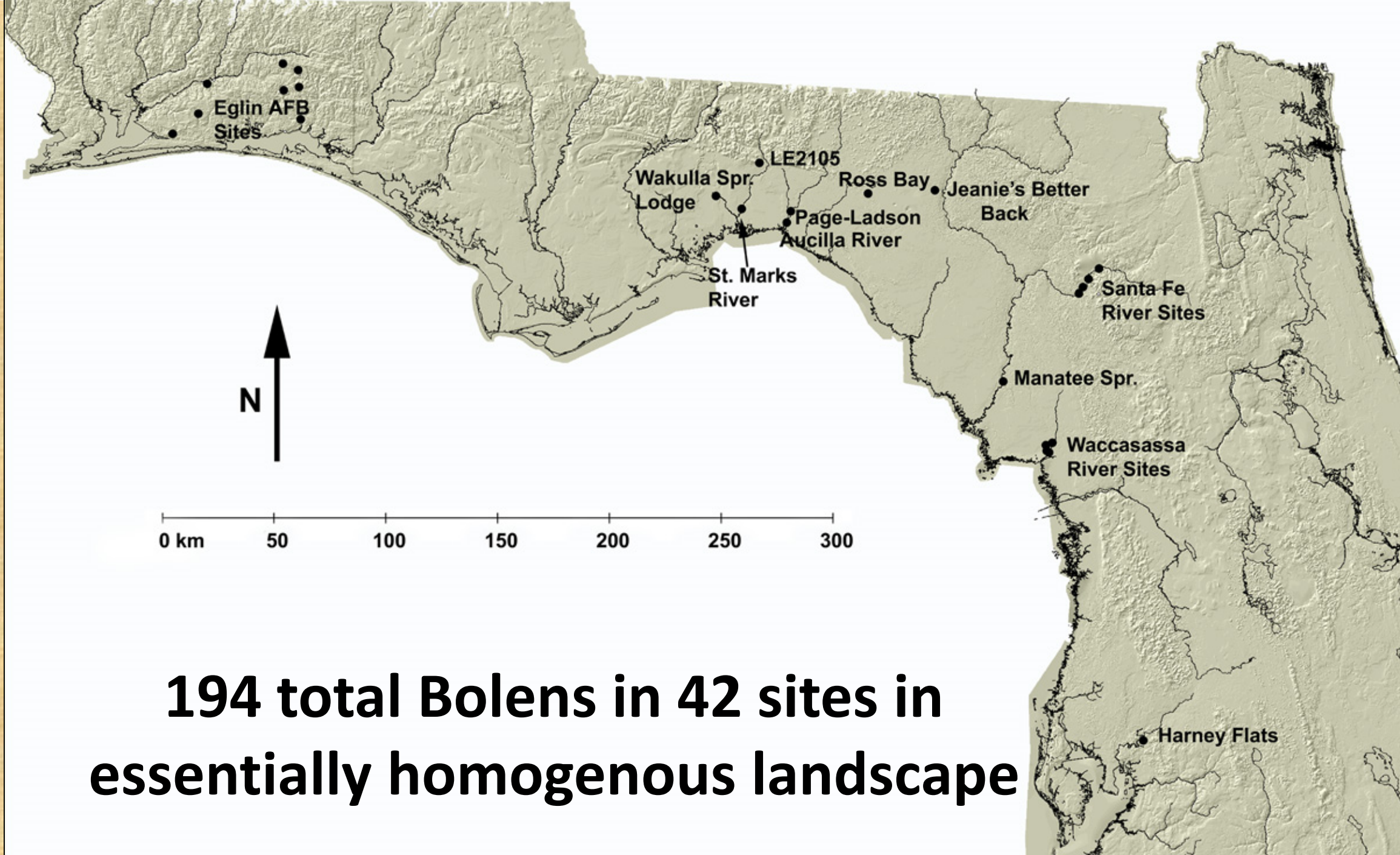


CNA



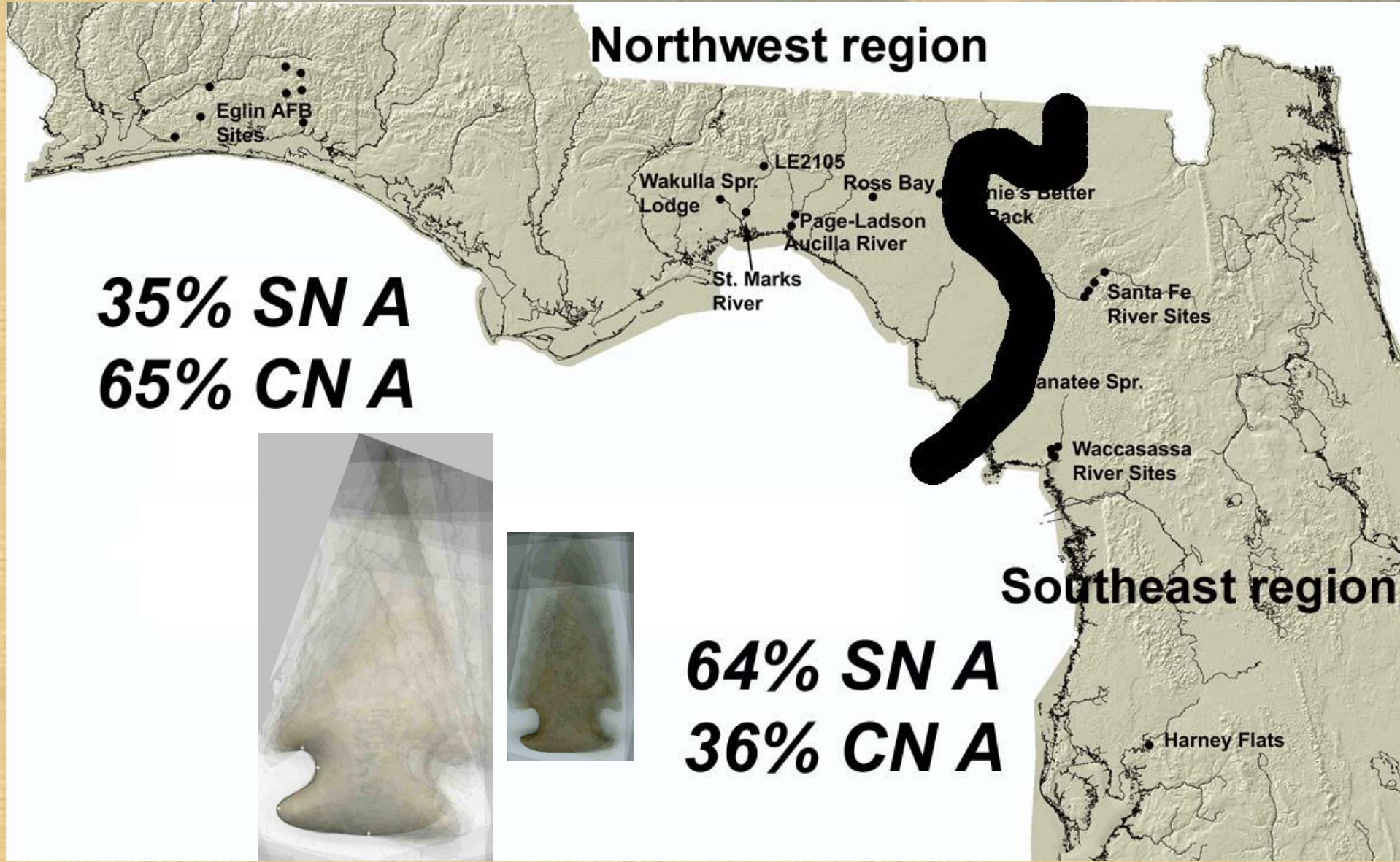
CNB

Made at the same time



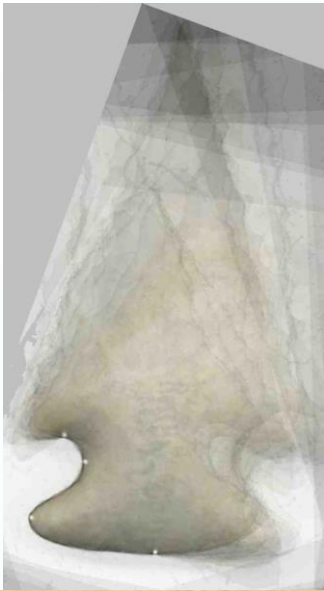
194 total Bolens in 42 sites in essentially homogenous landscape

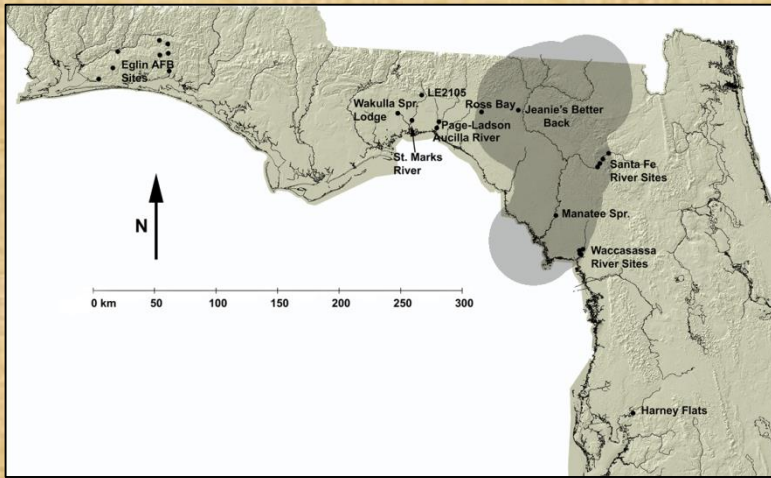
Distribution of SN A and CN A Bolen Varieties



35% SN A
65% CN A

64% SN A
36% CN A

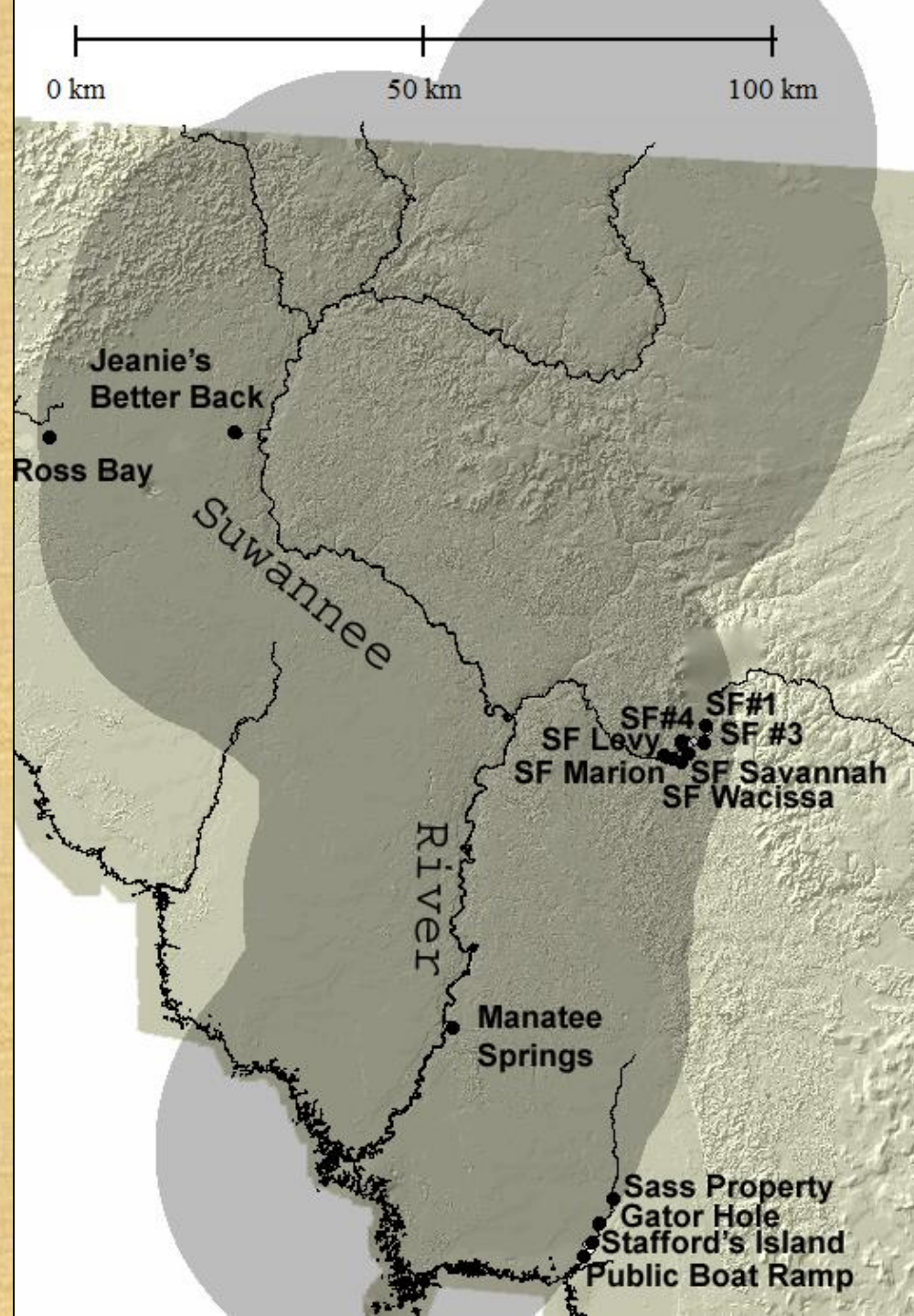




Interaction zone 35 km either side of the Suwannee River

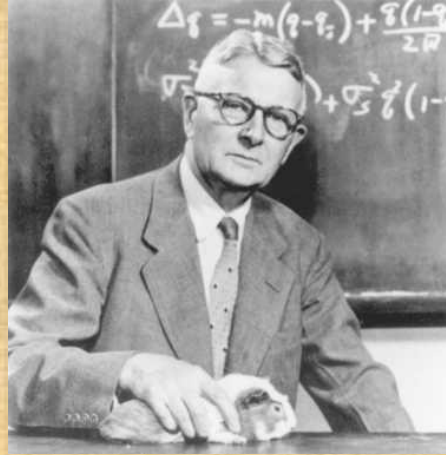
People will be in more frequent contact than with others more distant

If we think of this zone as the adjacent edge of 2 neighborhoods



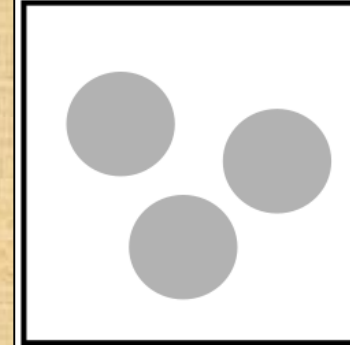
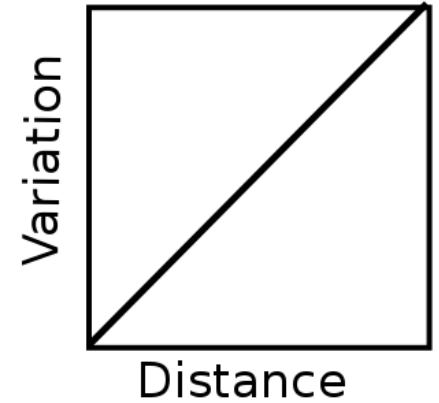
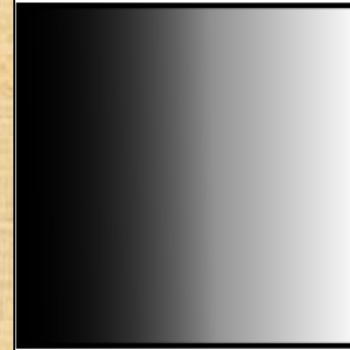
Sewall Wright

Population geneticist

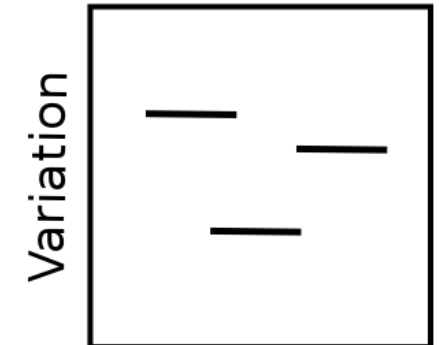


Self organization of systems over time where information is transferred.

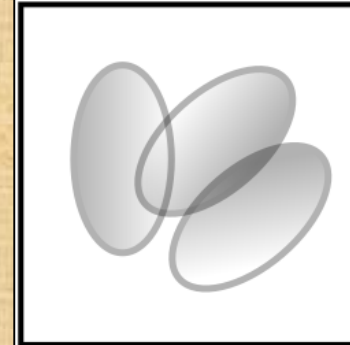
Distribution of variation produced by information transfer is determined by various impediments.



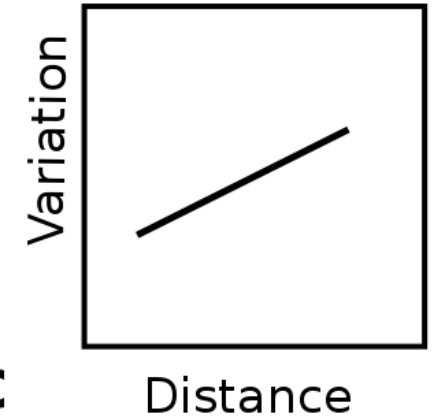
a



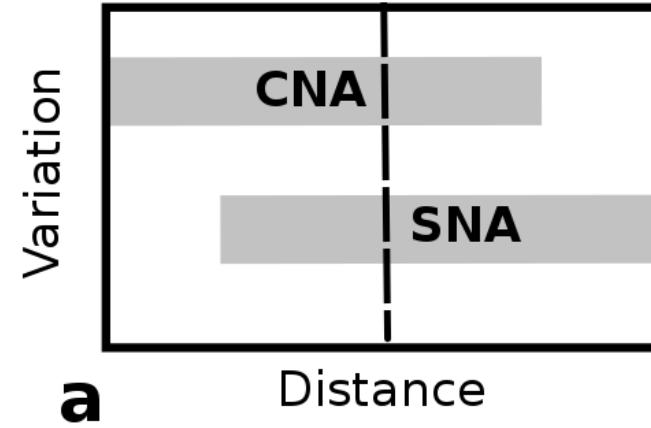
b



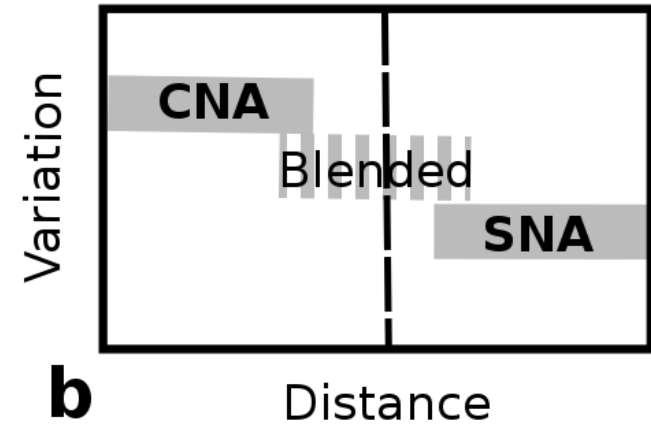
c



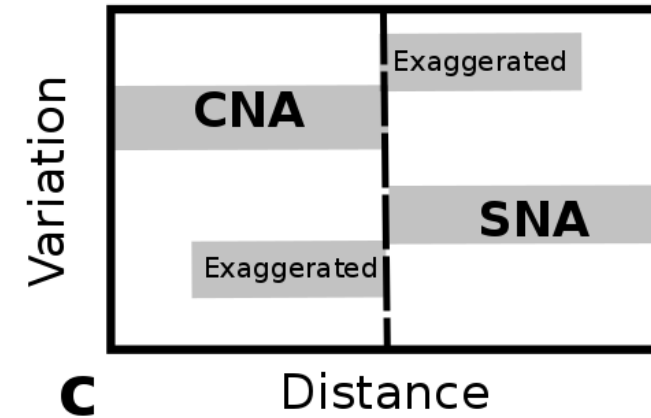
Null Hypothesis of No Change

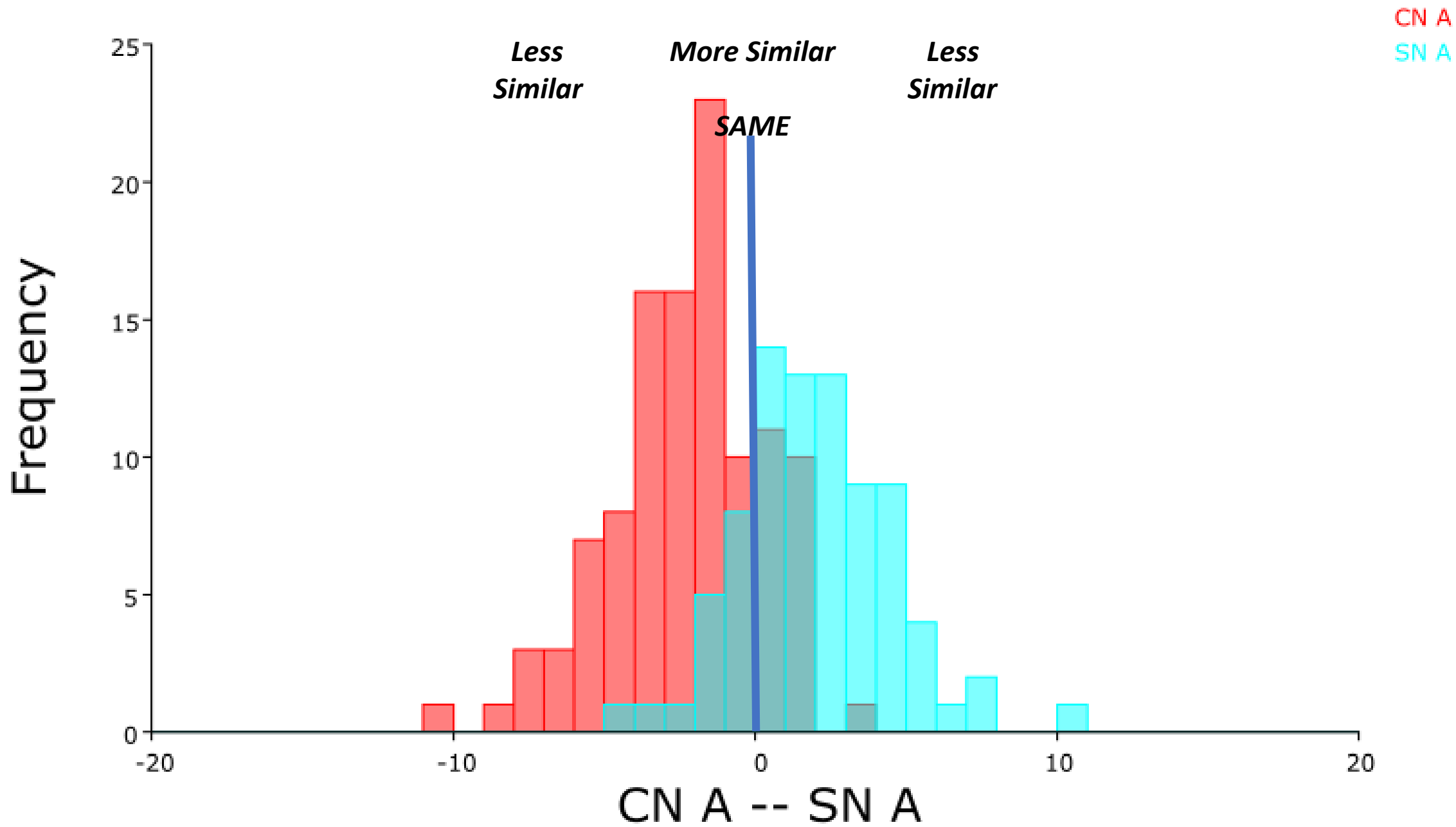


Blended Hypothesis



Exaggeration Hypothesis



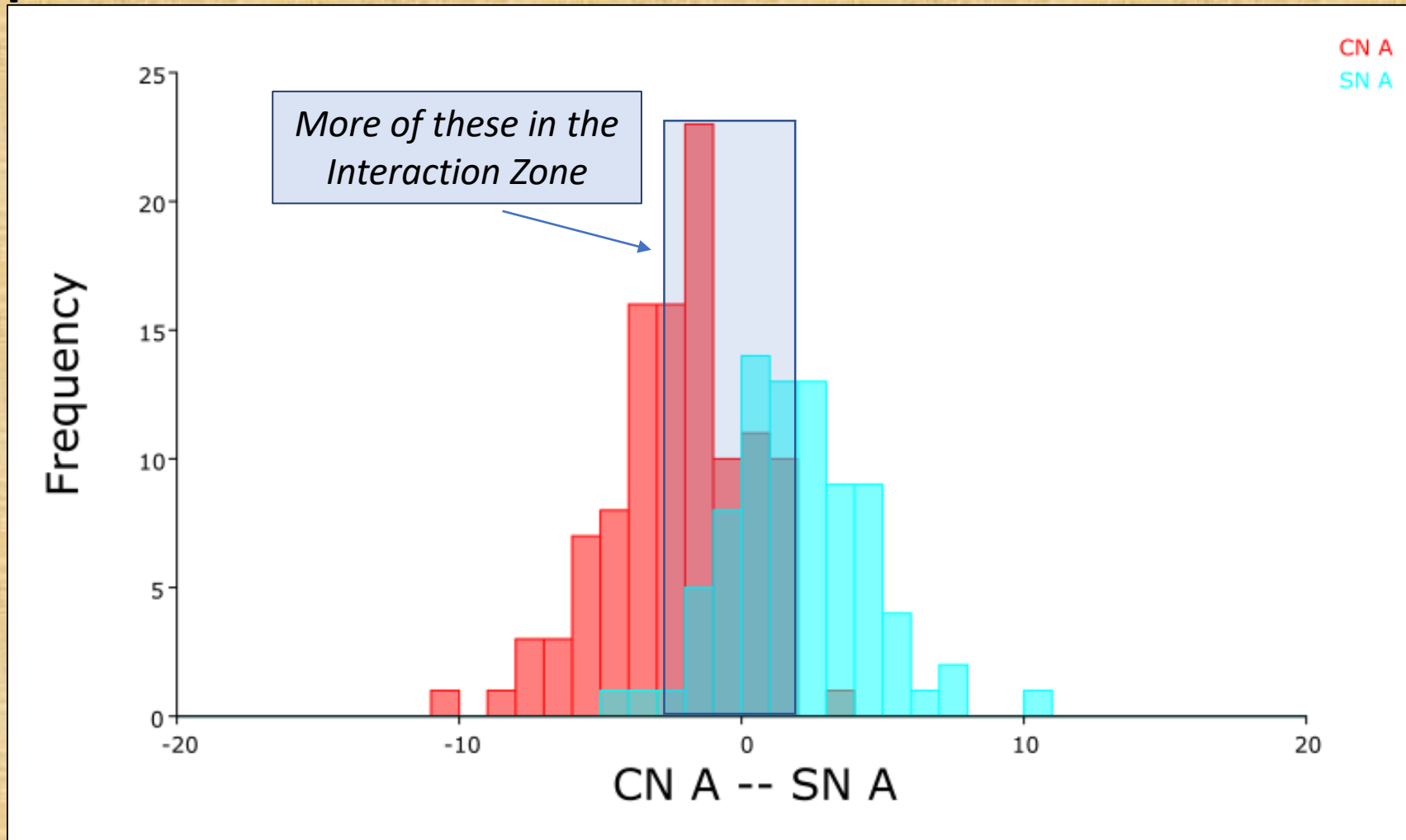


Testing the Hypotheses

Null Hypothesis: Are the shapes in the interaction zone not significantly different than those outside the zone?

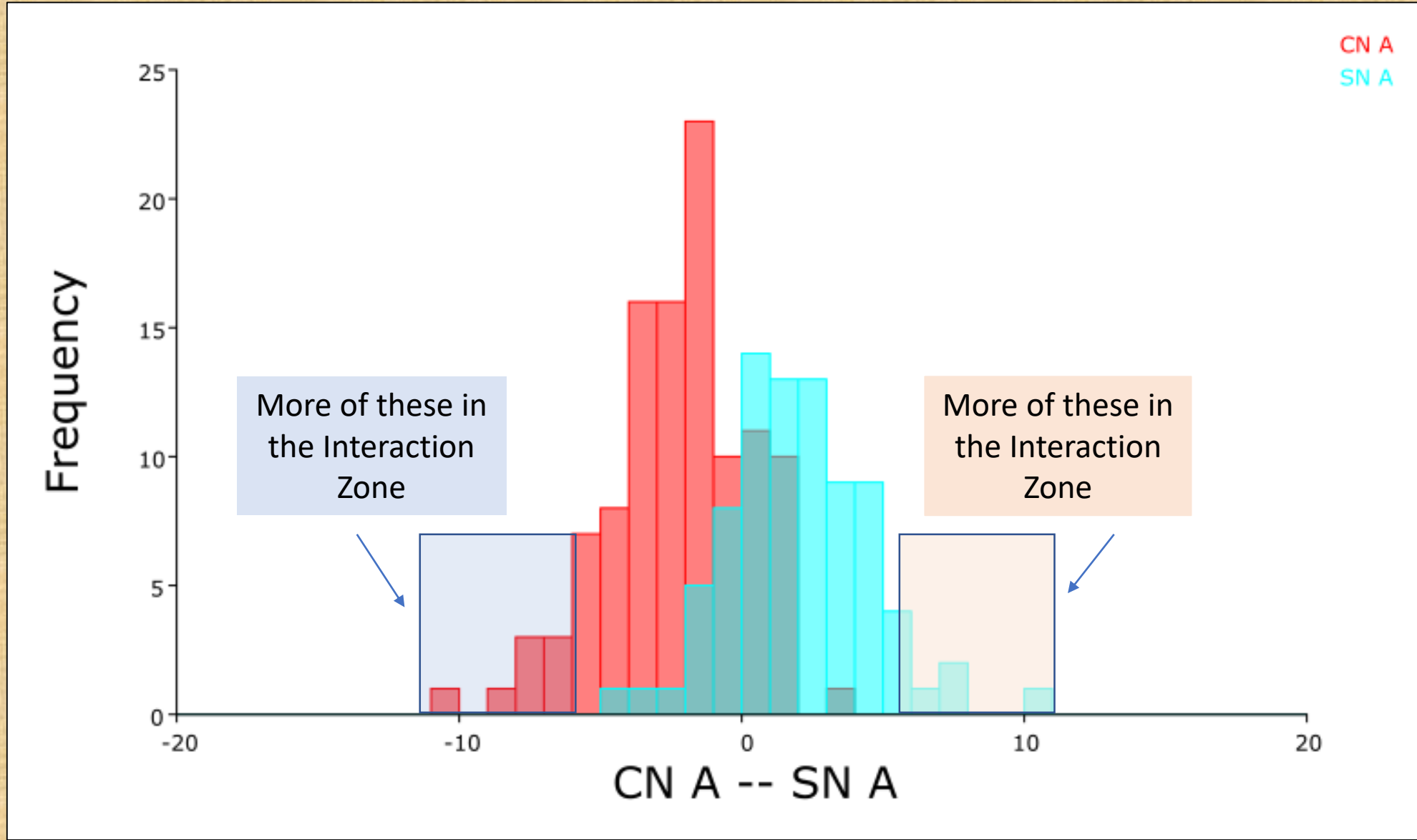
Blending Hypothesis

Are shapes more like one another in the zone than outside the zone?

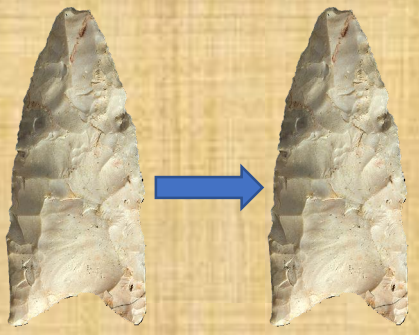


Exaggeration Hypothesis

Are greater shape differences in the Interaction Zone?



How might we get these chronological and spatial distributions?



Migration and Population Replacement

Diffusion of New Information and Local Adoption to Existing Designs

~~*Coincident adoption of the same design change in response to the same environmental change*~~



Adapting Design Changes to Predicate Forms

Minimally change the shape

Only modifications done to incorporate the design change

Keep the same size

No need to modify the handle or shaft

Keep the same manufacturing techniques

No need to learn new motor skills

Migrating or Replacement Population

No spatial differences in Design, Size, and Techniques

North Carolina Piedmont

**Hardaway-Dalton
(Hardaway)**



**Hardaway Side-notched
(Hardaway)**

Northern Alabama

**Nuckolls/Colbert-Dalton
(Stanfield Worley)**



**Early Side-notched
(Dust Cave)**

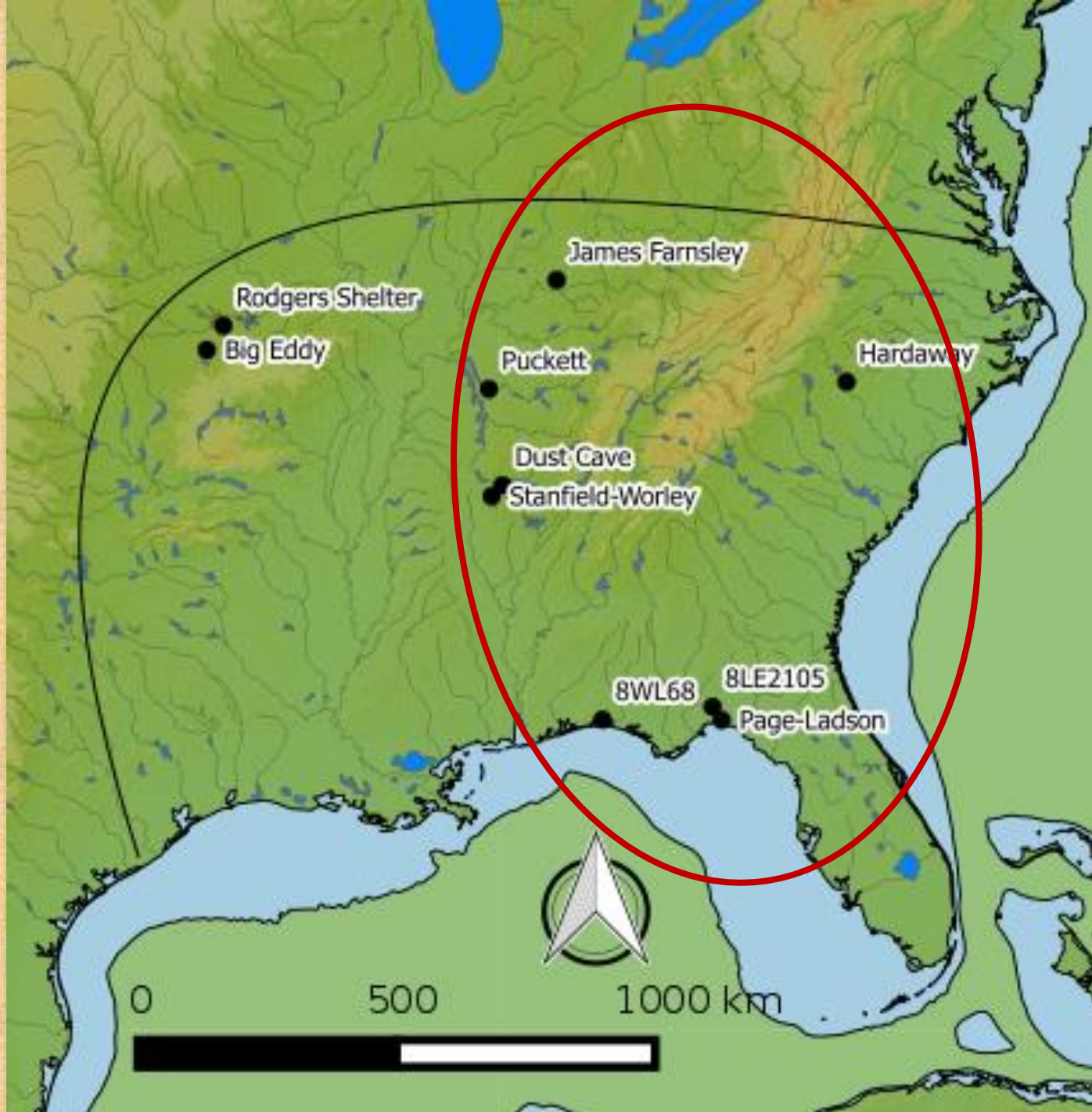
North Florida

**Greenbriar-Dalton
(North-central Florida)**



**Bolen Side Notch A
(North Florida)**

~11,700 BP



~11,500 BP

So

Dual Inheritance Theory + LGM allows us to parse subtle but statistically significant shape differences from which we can infer and test:

New Typologies that may better reflect the original makers' intentions

Spatial and temporal artifact variation with a firm theoretical basis (without resorting to environmental adaptation)

Regional interaction spheres

Local SLG interactions

Migration & population replacement or information diffusion

Thanks

Maile Neel, McClung Museum, Michael Faught, Mike Shott, Shane Miller, David Anderson, Florida State Museum, University of North Carolina, Florida Bureau of Archaeology, Don Munroe, Ike Rainey, and several private collectors.

