Dating

Advice, 10 cents
Two Types of Dating

• *Absolute* – assigns a numerical date to a past event

• *Relative* – does not equal “dating your sister”
  – Assigns order of events as older-than & younger-than (not how much)
Absolute Dating Methods

• Radiometric, half-life techniques
  – One half-life = time it takes for half of radioactive material to decay
    • Radiocarbon dating (HL = approx. 5,730 yrs)
    • Potassium-Argon dating (HL = 1.25 billion yrs)

• Other techniques
  – e.g., paleomagnetism, dendrochronology
A Smidgeon of Chemistry

• **Isotopes** = element forms whose nuclei have the same atomic number (number of protons in the nucleus) but different numbers of neutrons and mass
  – A *radionuclide* is an atom with an unstable nucleus
  – Undergoes radioactive decay by emitting subatomic particles
  – = radioactive isotope

• *If we can measure how fast decay occurs, we can date stuff*
Radiocarbon Dating

• Uses $^{14}$C, which is radioactive
  – Half-life $\approx 5,730$

• How does one know that one half-life has passed?
  – Ratio of $^{14}$C to either $^{13}$C or $^{12}$C (stable)

• Can be used to date organic matter (carbon)
• Only useful back to a maximum of 60,000 years ago
Two Important Concepts

• **Target Event**: what you would like to know the age of

• **Dated Event**: what you end up obtaining the age of

• **Target & Dated Events are not necessarily the same thing**
In which of the following are the TE & DE the same? Different?

Event = Skeleton W

Event = Pot 1

Event = Brick

Event = Pot 5

Which is older W or X?

www.utexas.edu/courses/denbow
Relative Dating

A matter of style and function
Temporal Types

• Artifact forms that occurred during a restricted period

• **Historical significance test (HST)** = determines if form occurs over a short, discrete period
  – If not, it is not a good temporal type

• We use the PoS, PoA & C\textsuperscript{14} dating, and PoSI to administer the HST
**SOSI BLACK-ON-WHITE**
**CA. 1070-1180**

**Paste:** Light gray to white  
**Temper:** Fine sand  
**Surface:** Polished and slipped, slip is sometimes fine and grainy and may contain flecks of mica  
**Forms:** Bowls and jars, rarely ladles  
**Design:** Opposed barbed lines, interlocking rectilinear elements, jars have a band of decoration on body with simpler design on neck  
**Comparisons:** Very similar to Flagstaff Black-on-White, but lines tends to be thicker and designs larger
Mesa Verde Black-on-White

Anasazi
*AD 1200-1300.*
Mesa Verde Black-on-White
This mug was collected circa 1894.
Clay. H 9.0, D 11.2 cm
Palmer Collection, Chaco Culture National Historical Park, CHCU 92335
Dalton point Circa 10,500 – 9900 BP

Clovis points
Circa 11,500 to 10,800 BP

Folsom points
Circa 11,000 to 10,100 BP
Calf Creek Points
Late Archaic period
Circa 6000 BP
Cultural Evolution

• Artifacts reflect memes; recipes (ideas) on how to build artifacts (e.g., pottery)

• Selection works on ideas or memes
  – Memes persist because they solve problems
  – Examples: projectile points or wheels, general forms of which persist for long periods

• Some memes are adaptively neutral
  – They are not selected for or against
  – Three-tined vs. four-tined forks & decorative motifs on pottery
Change

• Because artifacts change through time *their forms* can be used to mark time

• Temporal types are artifact groups that are useful time-markers

• Change can be the result of selection or not (might be neutral memes that drift)
Style & Function

• Stylistic variation in memes is not acted upon by selection
  – Style = adaptively neutral cultural variation (reflected in artifacts)

• Functional variation in memes is acted upon by selection
  – if an idea works it persists until other, better adapted ideas out-compete it
Style

• Styles tend to come in, experience a peak in popularity and disappear
  – Why? Because selection does not keep these memes in the population

• Stylistic variation disappears more rapidly than functional variation
  – Types based on styles tend to be good temporal types
Temporal Types & Style

• Why do styles tend to be better temporal types than does functional variation?
  – Short durations
  – Usually one occurrence
  – Highly variable
Temporal types based on stylistic variation tend to have distributions that look like these.

A rise, peak, and fall through time.

Remember, they tend not to persist because they are not functional and are not selected for.
Function

• Functional variation *could* be short in duration, have one occurrence, etc. *but it tends not to*

• Once a meme (and its artifacts) is selected for it tends to persist unless the environment changes
Functional Variation in Transportation: variation persists & may not occur only once
Chronology

• A goal of archaeology is to provide cultural chronology for a region

• Accomplished through use of temporal types

• How we group artifacts (memes) is important
We hope to end up with a chronology like this one based on forms of artifacts.
Periodization

• We tend to create past cultures through periodization

• Take, for example, the Reveille Phase in the Gatecliff chronology

• It has Rosegate, Elko side notched, Elko eared, Gatecliff contracting, Gatecliff stemmed, and Humboldt points.
  – Compare to the Devil’s Gate Phase; what is inbetween?

• The phases are actually arbitrary chunks of a continuum; the “cultures” are not real

• But they take on a reality: Baytown Plain pottery example
Summary

• Dating allows ordering of cultural change

• Provides the back bone of archaeology
  – Time, space, and form

• Together we use these to trace cultural evolution using
  – Using components, phases, traditions, and horizons

• We will study cultural evolution in three phases
  – Mesa Verde, Hohokam, & Chaco