General Dating Concepts

Relative dating: determines if something is older or younger, but can’t tell how much older or younger

Chronometric/Absolute dating: can tell how much older/younger something is.

Sample/Dated event: event that a particular dating method dates

Target event: event in which archaeologists are interested; what you want to apply the date to

Bridging argument: inferences that bridge between the sample and target events

Context

Chronometric Dating Methods

Dendrochronology
uses variations in the thickness of tree rings to determine age
One of first chronometric techniques developed
Important in SW U.S. and parts of Europe
A.E. Douglass: astronomer

Kinds of trees used
- sensitive to climatic fluctuations
- long-lived

Master chronology
Floating chronology

Obtaining a date

Dated event: death/felling of the tree

Dating range: varies across regions and trees
- W U.S., bristlecone pines - 9000 BP
- W U.S., sequoias, junipers - 2000 BP
- Western Europe, oaks - 7000 BP

Pros:
- Dendro dates are precise

Cons:
- limited to areas with master chronologies
- Accuracy can be affected by several things
- Bridging arguments

Obsidian Hydration
measures the layer of water formed when a fresh surface exposed

Hydration rind

How to...
- thin-section made from a flake
- examine under microscope, measure hydration rind
- convert rind measurement to age using $M^2 = Kt$

Hydration rate: the rate at which water absorbs into the obsidian

Dated event: exposure of new surface, often corresponds to target event

Dating range: 500-100,000 depending on region
**Obsidian Hydration** cont.

Things affecting hydration rate
- large-scale temperature differences
- micro-climatic differences
- chemical composition of rock

Pros: dates an archaeological event

Cons: limited to areas with obsidian

**Radiocarbon Dating**

W.F. Libby

Radioactive carbon
- Isotope - same # of protons, different # of neutrons
- Radioactive isotopes decay

Carbon cycle
- **Half Life**: The time it takes 1/2 a sample of radioactive isotope to decay.
  - Libby half life: 5568±30
  - Cambridge half life: 5730±40

Determining age
- count beta particles emitted as $^{14}$C decays
- modern sample: 14 beta particles per minute per gram of material

Calibration
- method assumes that $^{14}$C production is constant over time
- $^{14}$C production can vary significantly
- calibration curves
- Radiocarbon years versus Calendrical years

Contamination
- no old or young carbon added to sample

**Accelerated Mass Spectrometry (AMS) Radiocarbon Dating**

- counts the actual $^{14}$C atoms
- differences from conventional radiocarbon dating
- background radiation no longer a problem
- requires smaller samples
- less processing time