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 signficantly
- 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