Archaeology
Chapter 7 Review : Determining Time in Prehistory

LEARNING OBJECTIVES

After completion of this unit, you should be able to:

1. Know the importance of dating and chronology in archaeology
2. Describe the different kinds of relative dating techniques
3. Be familiar with the ways relative dating has been used in archaeology
4. Describe the different kinds of absolute dating techniques
5. Know the history and technology behind radiocarbon dating
6. Be familiar with the ways absolute dating has been used in archaeology

CHAPTER SUMMARY

- I. Radiocarbon Lab at University of California, Riverside
- II. What Is So Important about Time?
  - A. Nature and importance of chronology in the study of the human past
- III. Older or Younger? Relative Dating in Archaeology
  - A. Stratigraphy and superposition
    1. Charles Lyell and the Law of Superposition
  - B. Index fossils and biostratigraphy
    1. example of using extinct pigs to place *Australopithecus* in correct temporal sequence
  - C. Temporal types
    1. e.g., the three age system: Stone, Bronze, Iron Age
  - D. Seriation
    1. seriation frequency curves to demonstrate stylistic popularity change through time
    2. context-based seriation
  - E. Example: Temporal Types in Great Basin Archaeology
  - F. Example: Seriation in Ancient Greek Coins
  - G. Flourine, Uranium, and Nitrogen (FUN) dating
    1. use of FUN dating in Piltdown case
- IV. How Old Exactly? Absolute Dating
  - A. Cross-dating and dendrochronology (tree-ring analysis)
    1. history of tree-ring analysis
    2. limitations of dendrochronology
  - B. Radiometric techniques
    1. the principle of atomic decay
    2. radiocarbon, potassium-argon
  - C. Radiocarbon dating
    1. only for organic remains
    2. Willard Libby and the beginnings of radiocarbon dating
    3. how radiocarbon forms
    4. assumptions about radiocarbon
    5. collecting radiocarbon samples in the field
    6. preparing samples for radiocarbon dating
    7. methods of radiocarbon dating: gas decay counting, liquid scintillation decay counting, accelerator mass spectrometry
    8. limitations of radiocarbon dating
  - D. Dating the Shroud of Turin
    1. accelerator mass spectrometric dating
  - E. Potassium-Argon Dating (K/Ar)
    1. use of K/Ar dating in east African hominid sites
  - F. Dating with uranium
    1. for limestone cave deposits
  - G. Fission track dating

1. for volcanic glass, manufactured glass, and crystalline minerals in ceramics

H. Thermoluminescence (TL)
    1. commonly used to date pottery
I. Electron spin resonance (ESR)
J. Archaeomagnetism
K. Obsidian hydration

V. Chapter Summary

KEY CONCEPTS

- Accelerator Mass Spectrometry A technique of radiocarbon dating in which the carbon 14 atoms are directly counted.
- Archaeomagnetism A dating technique in which the position of Earth's magnetic poles can be measured in certain materials, primarily clay, and compared to the known position of the poles over time.
- Archaeometry The science of archaeological measurement, such as dating or other scientific techniques.
- Biostratigraphy A dating technique that uses the known ages of certain index fossils from one region to estimate the age of those same fossils in another region.
- Chronology A description and dated sequence of material.
- Dendrochronology A dating technique in which the tree rings of certain archaeological specimens are matched to a master ring plot to determine the age of the specimen.
- Electron Spin Resonance A dating technique that uses microwave energy to measure residual energy trapped in archaeological materials, thus enabling an estimate of their age.
- Fission Track Dating A dating technique in which the damage (tracks) resulting from the decay of uranium 238 can be counted and used to estimate the age of the material.
- FUN Analysis A dating technique using the quantities of fluorine, uranium, and nitrogen to measure relative age in bone.
- Half-Life The time it takes for one-half of the total amount of a given radioactive sample to decay.
- Index Fossils Specific species whose mere presence can be used to date strata because their age is known.
- Libby Curve of Knowns A series of radiocarbon dates on materials that matched their known ages and confirmed the accuracy of the radiocarbon dating method.
- Libby Half-Life the original estimated half-life of radiocarbon, established as 5,568 ± 30 years.
- Obsidian Hydration Analysis A dating technique that measures the amount of water penetration into the surface of a break to estimate how long ago the piece was broken.
- Potassium – Argon Dating A radiometric dating technique in which radioactive potassium decays to argon at a known rate, good from about 100,000 to 4.6 billion years ago.
- Radiocarbon Dating A chronometric dating method in which the amount of radiocarbon within an organic sample is measured and used to determine how long ago the sample died.
- Radiocarbon Years Before Present The unit of measurement reflected in a radiocarbon date. To equate to calendar years, the radiocarbon date has to be calibrated.
- Seriation A relative dating technique that plots specific changes in the frequencies of certain artifact styles over time to gauge their popularity at any point in the past, thus placing them in a sequence relative to each other.
- Thermoluminescence Dating A technique in which the energy trapped within the structure of certain materials can be released, measured, and used to estimate the age of the specimen; commonly used to date pottery and burned clay features.
- Three-Age System A chronology (Stone, Bronze, and Iron Age) developed for Western Europe in the early nineteenth century.
- Uranium-Thorium Dating A chronometric dating method in which the ratio of uranium to thorium within a calcite sample is measured and used to estimate when the calcite formed, such as in cave deposits.