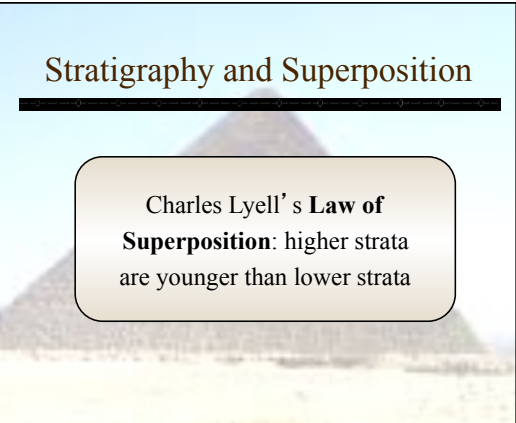


Stratigraphy and Superposition

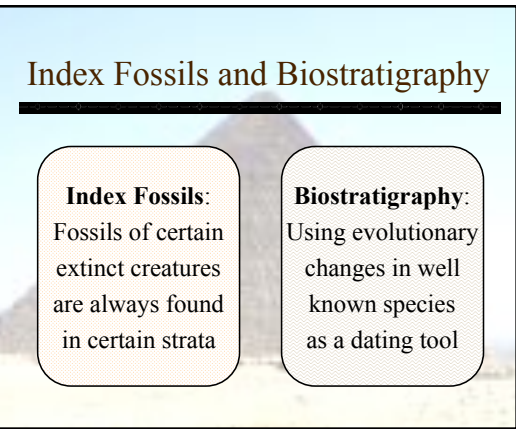
Charles Lyell's **Law of Superposition**: higher strata are younger than lower strata



Index Fossils and Biostratigraphy

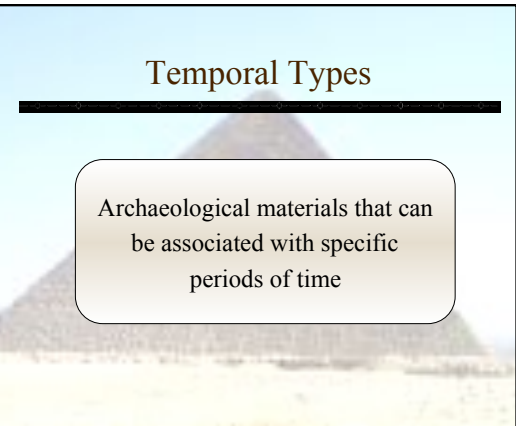
Index Fossils: Fossils of certain extinct creatures are always found in certain strata

Biostratigraphy: Using evolutionary changes in well known species as a dating tool



Temporal Types

Archaeological materials that can be associated with specific periods of time



Seriation

Tracking and graphing stratigraphic changes in stylistic frequencies

Context-based seriation

Frequency-based seriation

Fluorine, Uranium, and Nitrogen (FUN) Dating

- **Buried bones slowly lose nitrogen over time**
- **Buried bones also absorb fluorine and nitrogen over time**
- **Can tell if a bone has been buried for as long as associated bones in the archaeological record.**

How Old Exactly? Absolute Dating

Absolute Dating provides a specific temporal assignment in terms of years

Cross-Dating

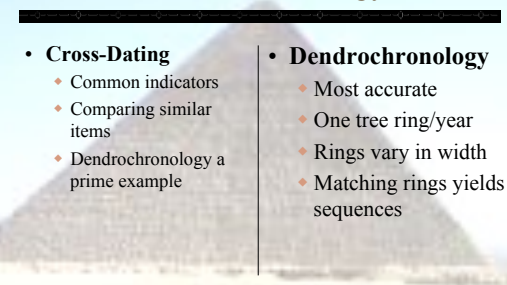
Dendrochronology

Radiometric Methods

Cross-Dating and Dendrochronology

- **Cross-Dating**
 - ◊ Common indicators
 - ◊ Comparing similar items
 - ◊ Dendrochronology a prime example

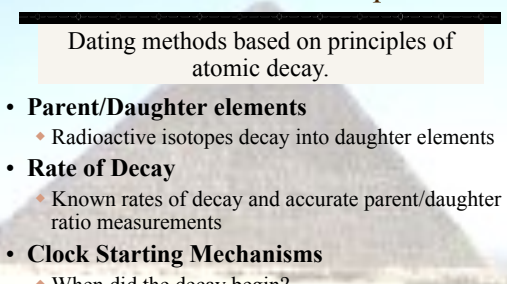
- **Dendrochronology**
 - ◊ Most accurate
 - ◊ One tree ring/year
 - ◊ Rings vary in width
 - ◊ Matching rings yields sequences



Radiometric Techniques

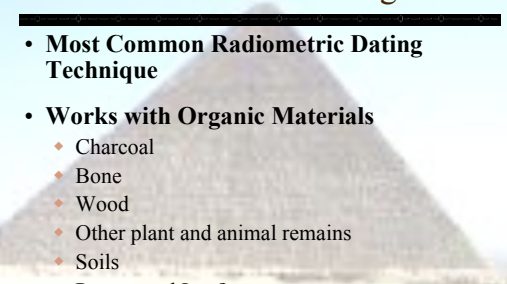
Dating methods based on principles of atomic decay.

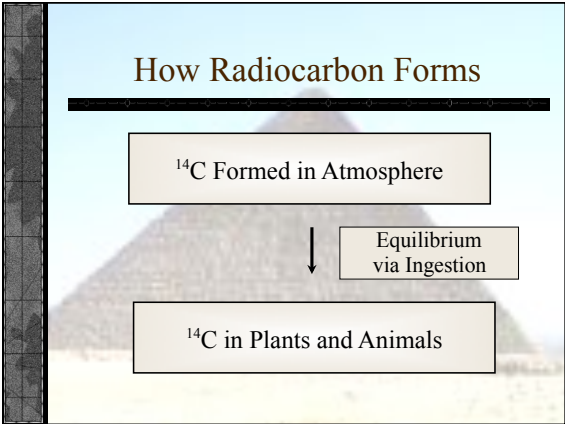
- **Parent/Daughter elements**
 - ◊ Radioactive isotopes decay into daughter elements
- **Rate of Decay**
 - ◊ Known rates of decay and accurate parent/daughter ratio measurements
- **Clock Starting Mechanisms**
 - ◊ When did the decay begin?

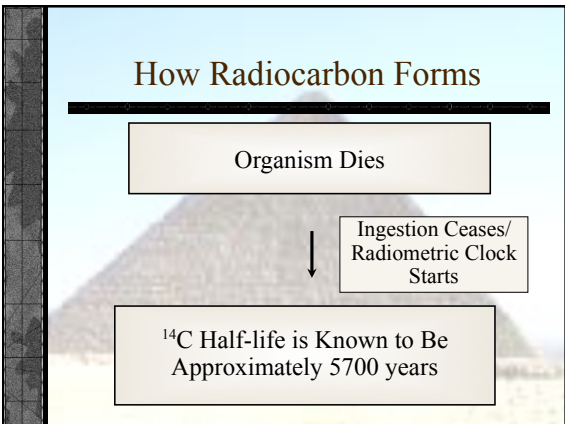


Radiocarbon Dating

- **Most Common Radiometric Dating Technique**
- **Works with Organic Materials**
 - ◊ Charcoal
 - ◊ Bone
 - ◊ Wood
 - ◊ Other plant and animal remains
 - ◊ Soils
 - ◊ Pottery and Iron?







- ### Assumptions about Radiocarbon
- ¹⁴C concentration has been constant (?)
 - ¹⁴C mixes rapidly upon production
 - ¹⁴C amount in samples is unaltered
 - The half-life of ¹⁴C is accurately known
 - Natural levels of ¹⁴C are accurately measured

Assumptions about Radiocarbon

- Fluctuations in Magnetic Field Have Influenced Past ^{14}C Production
- Calibration Curves Based on Tree Rings Convert Radiocarbon Years into Calendar Years

Collecting Radiocarbon Samples in the Field

Stratigraphic Context	Meaningful Association
Careful Collection	Sterile Storage

More Issues with radiocarbon Dating

- Preparing Samples**
 - 2 to 100 grams needed
 - Cleaned and Treated
- Methods of Dating**
 - Gas Decay Counting
 - Liquid Scintillation Decay Counting
 - Accelerator Mass Spectrometry (AMS)
- Limitations**
 - 300 to 50,000 years

