**Behavior and Archaeology**

- Dynamic vs. static
- Systemic vs. archaeological context =
- Transformational process =
- Archaeological site formation =
- "Exiting" systemic context =
- Predepositional process =
- Postdepositional process =

**Sediment**

- Source-sink model

**Sedimentary Environments**

- Glacial; coastal; alluvial; lacustrine; colluvial; spring; aeolian
- Depositional energy

**Post-depositional Processes**

- Active vs. stable land surfaces
- Soil and soil formation
- Physical processes
- Chemical processes
- Biotic agents

**Full Life-history Model**

**Diagnosing Transformations**

- Matrix =
- Provenience =
- Association =
- Context =
- Primary context =
- Secondary context =

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**Systemic Context =**

- The function or response of a physical object within a dynamic system of behavior
  - Ceramic vessel → used in a particular systemic context
  - Red deer population → responds to predation pressure in systemic context
  - Soil → responds to the frequency of farming and types of crops

**Archaeological Context =**

- Physical remains that have "exited" systemic context and become part of the static geological record
  - Stone tool → a "trace" of the function in systemic context
  - Skeletal element → a "trace" of the red deer population

**Transformational Process =**

- Agencies that "convert" physical objects from systemic to archaeological context
  - E.g., discard, abandonment, loss

- Agencies that "distort" the characteristics of physical objects in archaeological context

*The Formation of Vegetable Mould Through the Action of Worms With Observation of Their Habits*

Charles Darwin 1882
systemic context =
- life-history model
  - artifacts, features, sites and regions progress through as series of distinct stages
  - acquisition $\rightarrow$ transport $\rightarrow$ manufacture $\rightarrow$ use $\rightarrow$ maintenance $\rightarrow$ recycling $\rightarrow$ discard
  - acquisition = search and collection of material
  - manufacture = modification of material
  - transport = movement of materials from acquisition site
  - use = activity involving artifact, feature, ecofact or site
  - recycle/maintenance = re-manufacture or modification of object for use in same (maintenance) or different (recycle) activity
  - deposition = accidental or intentional disposal of artifact, ecofact or feature, or abandonment of site

acquisition = digging for clay

manufacture = forming pots

manufacture = kneading clay to remove bubbles

manufacture = mass open kiln firing
transport = bringing goods to market

use = cooking dinner

use = thermal failure of pot on fire
discard = discard broken pot

acquisition = digging for clay

different life-histories combine different stages, what do they all have in common?

acquisition = digging for clay

IDEATIONAL
SOCIAL
TECHNOLOGICAL

transport = goods to market
transformational process =
- agencies that “convert” physical objects from systemic to archaeological context
  - discard, abandonment, loss…
  - 99% of the archaeological record is garbage! i.e., people have intentionally discarded a physical object as no longer “useful” in systemic context

- agencies that “distort” the characteristics of physical objects in archaeological context
  - modification and preservation (destruction) of the archaeological record
  - predepositional process = transformation before burial
  - postdepositional process = transformation after burial

transformational process =
- cultural transformation: human behaviors that intentionally OR unintentionally convert objects to archaeological context OR distort archaeological context
  - discard vs. loss
  - looting vs. digging a well

- natural transformation: non-human agents that convert objects to archaeological context or distort archaeological context
  - deposition via natural disaster (e.g., volcanic eruption)
  - erosion via wind, water, gravity
  - destruction via soil pH, earthworms

transformation processes in action

Land Surface
cultural transformation process

physical object discarded

Land Surface

predepositional transformation

water flow moves object from discard location

Land Surface

object buried below ground surface

Land Surface

postdepositional transformation

soil water chemically dissolves object
archaeological reconstruction

method and theory

how and when was the object buried below the surface?

method and theory

was the object modified by a postdepositional transformation?

method and theory

how and why was the object discarded?
does the object retain traces of life-history stages?

method and theory

- archaeological site formation: what happens after materials have exited systemic context?
- Note: once out of systemic context, a physical remain of human behavior is just like any other sedimentary particle subject to the same physical, chemical and biotic forces!!!
- must think like a geologist…
  - how do sediments accumulate?
  - how are sediments transformed?
  - how are sediments destroyed?

- sediment =
  - fragmented solid materials that have been transported and deposited by some agency and that forms loose unconsolidated layers

  - texture = grain size
  - structure = visible layers (beds)

Source-Sink Model of sediment accumulation
probability that materials are transformed varies with
- where human behavior is in source-sink system
- depositional environment…

■ typology of sedimentary environments (Waters)
  - glacial
    - sediments transported and deposited by glacial ice
  - coastal
    - … by wave and tidal processes along coastlines and deltas
  - alluvial
    - … by flowing water (i.e., streams, rivers)
  - lacustrine
    - … by standing water (i.e., bogs, ponds, lakes)
  - colluvial
    - … by gravity (i.e., on slopes)
  - spring
    - … by water emerging at the ground surface
  - aeolian
    - … by wind

■ burial of physical remains (transition to postdepositional regime)
  - active sediments
    - sedimentary units that are in the process of being buried
  - stable sediments
    - sediments that are NOT in the process of being buried are therefore in the process of weathering
      - sedimentary particles are being broken down by physical, chemical and biotic agents
    - soil formation is the outcome of weathering of stable sediments

■ depositional energy and archaeological sites
  - sites found in high-energy environments are more likely to be predepositionally (and postdepositionally) disturbed
- an example of burial
  - materials accumulate on a stable land surface (a forming soil) over a period of time then are buried by renewed sedimentation

- postdepositional processes
  - transformations of sediment after deposition
    - texture: particle sizes tend to get smaller
    - structure: particles in distinct sedimentary layers tend to get mixed
  - physical/mechanical forces that destroy or mix sedimentary particles
    - gravity, sediment compaction, faulting
  - chemical reactions that destroy and/or mix sedimentary particles
    - groundwater dissolution (pH, rate of flow)
  - biotic agents (organisms) that physically and chemically destroy and/or mix sedimentary particles
    - burrowing, excavating, consumption

- reconstructing behavior from a pile of bones
  - how did the assemblage accumulate?

- burial of archaeological materials

Where is pre/post deposition transformation more severe?

be aware of the various ways that archaeological materials can be incorporated into soil and sedimentary units
- predepositional processes =
  - processes that affect the preservation of bone between the time of death and burial below the surface

Juvenile gemsbok, S. Africa

Bones transported and accumulated outside of a brown hyena den, Kalahari National Park

decomposition and disarticulation of a juvenile impala, S. Africa

carnivore tooth punctures in cancellous bone
Bone Weathering Stage 3
extensive exfoliation and deep cracking

- bone preservation after burial
  - decay and decomposition (syndiagenesis)
    - destruction of organic fraction in bone
    - dependent upon microbial activity (pre- and post-burial)
  - fossilization (anadiagenesis)
    - recrystallization and replacement of bone minerals
    - conversion of hydroxyapatite into some other mineral

- Teeth are much more common as fossils than are other bones. Why?

- systemic context + archaeological context =
  - a complete life history model

  - acquisition → transport → manufacture → use →
    maintenance → recycling → discard →
    predepositional transformations → postdepositional
    transformations → recovery by archaeologist

H. erectus teeth from Yuanmou, China