Skeletal Evidence for Population History

Or….
What can bones tell us?

Three ways to use human remains to learn about population history:
- Craniometric Analysis
- Isotopic Ratio Analysis
- Burial Context

Craniometric Analysis
- Uses standardized measurement points
- Records various dimensions relating to the shape of the skull
- Measurements and indices allow for comparisons between different specimens

Case Study: Bronze Age Populations in Tarim Basin, Western China
Hemphill and Mallory, 2003

Tarim Basin Archaeology of the Tarim Basin
- Over 300 mummies and thousands of skeletal remains have been recovered from sites in the Tarim Basin
- Excellent preservation of textiles
  - Presence of wool indicates influence from the West
  - Style of textiles indicative of pastoralist nomads from the Russian steppe
  - Silk at some sites as early as 2000 BC indicates contact with the East
Linguistic Evidence
- Documents show they were speakers of Tocharian, a western Indo-European language
- Source population may be a pastoralist population in the Eurasian Steppe

Biological Evidence
- Many mummies appear “Western” – fair hair, high b rided noses, heavy beard
- mtDNA (n=1) is Haplogroup H
  - Found commonly (40%) in European pop.
  - Also found in 15% of Near East pop.
- Previous craniometric study of 302 adult crania
  - 89% fall into “Caucasoid” type
  - 11% fall into “Mongoloid” type (Han, 1998)

Tarim Basin Mummies

So…where did the Bronze Age Tarim Basin populations come from?
- Archaeology, Linguistic, and Biological Data are unclear
- Indicate associations with steppe populations and western central Asian populations
- Two models of Tarim Basin population origins
  - Steppe Hypothesis
  - Bactrian Oasis Hypothesis

Steppe Hypothesis
- At least 2 migrations took place from the Russo Kazakh Steppe to the North
  - 1st migration from Altai region (north)
    - Similarities in material culture include metallurgy, burial practices, and textiles
    - Also may be the source of the Tocharian languages
  - 2nd migration from Kazakhstan/Ferghana Valley (northwest) around 1200 BC
    - New clothing styles, ceramic wares, changing burial customs, tin and bronze objects, objects associated with horses
Bactrian Oasis Hypothesis

- At least 2 migrations took place
  - 1st migration from sedentary, agricultural populations of Oxus Civilization of West Central Asia (Uzbekistan, Afghanistan, Turkmenistan)
    - Irrigation technology allows colonization
    - Archaeological evidence: wheat, sheep, goats, irrigation systems
  - 2nd migration from Kazakhstan/Ferghana Valley (northwest) around 1200 BC
    - New clothing styles, ceramic wares, changing burial customs, tin and bronze objects, objects associated with horses

Current Study
(Hemphill and Mallory, 2003)

- The current study compared craniometric measurements from 3 sites in the Tarim Basin (n=82) to 25 comparative samples (n=1271) from regions including the Russo-Kazakh steppe, southern China, Central Asia, Iran, and the Indus Valley to determine which, if any, were most similar

Results:

<table>
<thead>
<tr>
<th>Steppe Samples</th>
<th>North Bactrian Samples</th>
<th>Indus Valley Samples</th>
<th>Han Chinese Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>QAX: Early Bronze Age, 1800 BC</td>
<td>ALW: Late Bronze Age, 650-200 BC</td>
<td>KRO: Late Bronze Age/Early Iron Age, 202 BC – AD 150</td>
<td></td>
</tr>
</tbody>
</table>

Conclusions:

- Steppe and Han populations did not play a role in the initial colonization of the Tamir Basin
- Possible relationship to Indus Valley?
- Indigenous population at QAW?
- Sampling insufficient?
- Effect erased by time and small populations?
- Could later sites indicate contact with Western Central Asia (Oxus pop. of North Bactrian region)?

Stable Isotope Analysis…or you are what you eat!

- The elements (Carbon, Nitrogen, Sulfur) in your body’s tissues come from your diet
- Different forms of an element are called isotopes
- The isotopes of elements in your food are transferred to your body tissues
Isotopic Analysis

- Isotopic analysis measures the ratio of the isotopes contained in the collagen of your bones, hair, etc.
- The ratio of the isotopes $^{12}\text{C}/^{13}\text{C}$ is expressed as $\delta^{13}\text{C}$ and $^{15}\text{N}/^{14}\text{N}$ is $\delta^{15}\text{N}$. 
- The isotopic ratios of certain foods leave a specific signature (or range of $\delta^{13}\text{C}$ or $\delta^{15}\text{N}$ values) depending on if they are marine resources, meat, or vegetation.
- Vegetative diets can be further subdivided into types based on the various photosynthetic pathways of plants ($C_3$, $C_4$, CAM).

Isotopic Analysis

Case Study: Reconstruction of Paleodiet in an Incan Mummy to determine geographic origin

Fernandez et al., 1999

Mount Aconcagua, Argentina

- 1985 – an expedition excavates the mummified body of a ritual sacrifice victim 5200 m high on the SW side of Mt. Aconcagua, Argentina (in the south of the Incan conquered territories).
- Textiles, head dress, woven sandals, and ritual offering items associated with the burial associate the site with the Incan Imperial Period, AD 1480-1532.

Archeology of Mt. Aconcagua

- Incan Sacrifice: Ritual practice, often times in sanctuaries on high summits of the Andes.
- Special occasions required the sacrifice of a child to the deities.
- The child travels to the Divine World as a messenger to preserve the cosmic and social order, considered a sacred rite and privilege.
- Little is known about the geographic origin of the sacrificial victims.

Incan Sacrifice

Current Study (Fernandez et al., 1999)

- Reconstruct paleodiet through stable isotope analysis to determine the Mt. Aconcagua mummy's geographic origin.
- Marine (coastal) Diet vs. Terrestrial (continental, altiplano) Diet.
- Foreign vs. Local Origin.
- $^{13}\text{C}$ and $^{15}\text{N}$ isotopic analysis of bone collagen from rib fragment – indicates long term diet.
- $^{13}\text{C}$ and $^{34}\text{S}$ isotopic analysis of hair – indicates short term diet (1.5 yrs.)
- Bone collagen from an adult individual at a local prehistoric cemetery at Uspallata represents local diet signatures.
- Results also compared with previous studies of isotopic ratios in a variety of environments.
Results:
- δ¹³C values for the mummy and Uspallata skeleton seem consistent with diets rich in C₄ plants (such as maize) or marine resources.
- δ¹⁵N values can help to clarify the diet between maize and marine resources.
- Uspallata skeleton δ¹⁵N value consistent with maize diet.
- Aconcagua Mummy δ¹⁵N value may indicate a mixed terrestrial/marine diet.

Results:
- δ¹³C values for hair samples show periodic variation – possible seasonality of local vegetative resources.
- δ³⁴S value also supports a non-marine diet in the year and half prior to death.

Conclusions:
- Analysis of collagen did not provide definitive information on diet – mixed marine/terrestrial diet.
- Analysis of hair clearly indicates a nonmarine diet prior to death and potentially seasonal variations in maize resources.
- At least 1.5 yrs. prior to death the boy was living in the local environment.
- Prior to this time, a mixed diet indicates a potentially foreign origin.

Burial Context
What Can We Learn?
- Funeral architecture, coffin, soil inhumation, pot burials – all can inform us about a culture’s mortuary practice(s).
- Reconstruct original body position.
- Arrangement of clothing, ornamentation, shroud, burial furnishings.
- Vertical and horizontal distribution of burials can be patterned and may reflect different areas of use based on: age, sex, trade group/occupation, family.

Basic Burial Positions

Burial Context
Case Study: Dia Shoma, a medieval cemetery in the Inner Niger River Delta of Mali
Zeitoun et al., 2004
The Empire of Ghana

Located along the Inner Niger River Delta
Favorable climate and water supply supports a rich human history of settlement for the last 3000 years
Environment supported a diverse economy of fishing, agriculture, pastoralism, and trade along the river between northern and southern Sahara

The Empire of Ghana

Empire of Ghana, AD 500-1000
Empire of Ghana ends violently as Muslim populations (Berbers and Moors) conquer the northern portion of the empire after AD 1000

Current Study
(Zeitoun et al., 2004)
Dia Shoma Cemetery has yielded some 100 individuals
Very poor preservation – biological profile difficult to establish (age, sex, stature, health status)
This site can still be informative based on analysis of burial contexts: 10 burial types identified on the basis of body position, orientation, structure of burial, and associated artifacts

Burial Types at Dia Shoma

Purpose
Compare burial types from Dia Shoma to gain information about human migration, settlement, cultural affiliation and lifeways of the various populations of the Western Sahara
Create a relative chronology of burial types at Dia Shoma to study change through time
Results

- Increase in fish, lizards, water fowl in the archaeology
- Sheep and goat remains also increase through time
- A reduction in African rice but an increase in millet, sorghum, and bread wheat
- The variety of burial categories and the changing environmental context suggests the presence of at least 3 resource specializations: fishermen, herders, agriculturists

Results

- Prior to AD 1000: burial types 1,2,3,4,6,7,8
- After AD 1000: burial types 1,5,8
- This may be the result of political change and the impact on trade and socio-economic systems in the region
- Possibly indicative of reduced migration in the area following the political and economic changes at this time