Animal and plant remains

Animal remains

- **Faunal analysis**: analysis of remains of animals
  - usually bone and teeth
  - also occasionally hair, hide, hooves, toenails, etc.
  - also fish bones and scales, often by a separate expert
  - shellfish are usually analyzed by yet another expert
- Done by a faunal analyst or zooarchaeologist
- faunal analysis
  - requires a lot of experience and very good spatial visualization skills
  - is usually done by comparing bones to a **comparative collection**
- Faunal analysts often spend a lot of time amassing their comparative collections
  - they disgust their friends and neighbors by collecting road kills
  - having strange animals cooked for them
  - boiling meat off bones and carcasses
  - burying carcasses to allow the meat to rot away, to be dug up later
  - establishing dermestid beetle colonies
    - these are bugs that eat dead meat
    - they clean the bones effectively without the damage caused by boiling, bleach, mechanical cleaning, etc.
    - often allowed to live in small, heated, sealed "bug rooms" where samples are left to be cleaned
- zooarchaeologists typically record
  - which specific bones and sections of the animals are present, and quantities of each
  - identify each element (whole bone; may be represented by multiple fragments)
  - the kinds of animals present, and how many of each, as specifically as possible
    - taxon: kind of animal (taxa, plural)
      - ideally to the species or even variety within species
        - but often only possible to the genus or family
        - or even sometimes just "large mammal" vs. "small mammal"
      - depends on preservation, research goals, etc.
  - age and sex of animals when possible
  - pathologies (injuries, diseases, etc.)
    - may suggest uses the animals had in life, like pack animals
  - tooth marks from dogs, other carnivores, rats, etc.
    - can suggest if the site was a dangerous place, frequented by carnivores
    - if the bone was left exposed (stinking and attracting insects) or buried, which might suggest a kill site vs. a longer-term camp
  - any marks from killing or butchering the animal
    - may show what parts were eaten, preparation for drying or smoking, etc.
  - smashing of long bones to get marrow out
- “pot polish” from boiling the bones
- modifications of bones or other parts, as in making tools or ornaments
- etc.
- the data is used for
- reconstructing the meat part of diet
  - what species were eaten
  - roughly how important meat was to the diet (or not)
  - whether the animals were herded or hunted
  - changes over time, etc.
- reconstructing seasonality of site occupation
  - that is, was the site occupied year-round?
    - if not, during what parts of the year?
  - based on ages at death of juveniles, from tooth eruption
  - and knowledge of the season when modern animals of the same species give birth
  - if juveniles died there at all ages, people were there with their herds, or killing the animals if wild, during the whole year
  - if juveniles died there only at certain ages, representing distinct seasons, then the site was probably occupied seasonally
    - say, 6 months after the birthing season, one year and six months after, two years and 6 months, etc.
    - corroborating evidence from other animals and plants would make this more convincing
- hunting methods
  - includes both material technology (spears, bows, etc.) and social "technology" (group coordination)
  - herd-management techniques
    - based on age and sex composition of the hunted animals
    - if they don't match the natural herd composition, then certain ages and sexes were preferentially selected to kill
    - if younger individuals and females were spared, this suggests conscious effort to maintain the herd, taking the less necessary individuals for food and leaving the reproducers to replenish the herd
    - this may be an initial step towards animal domestication
- determining when people domesticated animals in specific cultures
  - based on looking at changes in the animals' characteristics compared to their wild ancestors
- variations in diet may indicate ethnicity or status differences
  - Great Zimbabwe example (1250-1450 AD)
    - bone from the slopes below the “Acropolis” at Great Zimbabwe was overwhelmingly cattle, with a little sheep or goat
    - over 75% killed while still immature: i.e. veal
    - so food consumed on the Acropolis was the most valuable kind, presumably eaten by high-status people
    - at a smaller settlement with an enclosure wall (Manekweni)
the bones in garbage from inside the enclosure were dominated by cattle bones
– remember, in a cattle pastoralist society, cattle and beef are wealth
– while the bones in garbage from outside were dominated by sheep, goat, and game
– presumably lower-status people
– variations in body parts present may indicate processing or trade
– at the Peruvian site of Chavín de Huántar,
  – a town of 2,000 to 3,000 people, large for the region and time period,
  – with an important temple apparently visited by pilgrims from much of the northern Andes
– during the period of around 500 BC to 200 BC, wild animal bone virtually disappeared, replaced by domesticated camelid bone
– with a surprising lack of foot bones and heads
– the bones that are present may correspond to the bones that would be included in portions of dried (actually, freeze-dried) meat
– this freeze-drying process can only be done at higher elevations than Chavín
– so it must have been imported and traded for something at Chavín
– so the faunal analysis suggests a shift from locally hunted meat to domestic, processed meat that was brought to the site from elsewhere, probably in trade
  – that is, a much more complex and regional economy
– What to record and analyze?
  – NISP: Number of Identifiable Specimens
    – problem: many identifiable specimens might come from a single animal's carcass, or each one might represent a different animal
    – what if some animals have lots of distinctive, identifiable bones, while others have fewer bones per individual that can be definitely identified?
      – the harder-to-identify animals will be undercounted
    – what if some animals are brought to the site whole, while others are butchered where they were killed?
      – the butchered animals will be undercounted
  – MNI: Minimum Number of Individuals
    – somewhat better at estimating how many animals were involved in creating the record, but still a rough indicator
    – grams of bone of a given species or type
    – easy, but has problems similar to NISP
  – meat weight
    – estimated amount of meat that was on each bone
    – gives a better idea of the contribution of meat to the diet
    – avoids some problems of NISP, MNI, and bone weight
    – if we have all the bone from a pit, for example, who cares if two legs of lamb came from one lamb or two?
    – sometimes done by estimating amount of meat per animal
      – based on MNI
      – this has all the problems of MNI
but at least makes the meat contribution of different species comparable

- Botanical analysis
  - archaeobotany: study of ancient plant remains
    - focusing on reconstructing environment, climate, resource availability, etc.
  - paleoethnobotany: study of ancient plant remains
    - with a focus on plant-human relationships and their changes over time
    - diet and food preparation (cuisine)
    - implications about farming and gathering practices
    - determining if a site was occupied year-round, or only during certain seasons ("seasonality")
    - craft uses of plants (fibers for textiles, gourds for net floats, reeds for mats or house construction, basketry, etc.)
    - uses of plants for fuels
    - can have implications about ethnic, occupational, status, etc. relationships
  - macrobotanical remains: pieces of plant material that are big enough to pick out while excavating, or that turn up in the screen
    - in most sites, the only way that macrobotanical remains are preserved is by being carbonized (burned)
      - and usually, only things that are being cooked or used for fuel are likely to get in a fire and be preserved
    - but in very dry, frozen, or anaerobic wet sites, a lot of plant material can be preserved
    - a related kind of macrobotanical find: casts or impressions in ceramics, bricks, etc.
      - example of wheat and barley impressions from Mehrgarh, Baluchistan, early Neolithic (7000 - 4500 BC)
    - macrobotanical remains are often used to help to reconstruct diet
      - Peruvian examples:
        - kinds of corn and cobs
        - guavas, peppers, beans, etc.
    - macrobotanical remains are sometimes found in coprolites, also very useful for reconstructing diet
      - coprolites: dried feces (human, dog, etc.)
        - only preserved in special circumstances
          - usually very dry environments
        - often contain macrobotanical remains
          - also small bone fragments, microscopic botanical material, parasites that reflect general health status
          - a very direct, specific source of data on diet, even specific meals and cuisine
          - analysis requires specialists!
      - Peruvian example of coprolites
    - macrobotanical remains also often help to indicate non-dietary activities, crafts, architecture, etc.
      - farming for fibers:
        - cotton bolls, fiber, etc. indicate farming of cotton for textiles and/or seed oil
− finding the non-fiber parts of cotton indicates that people at the site were involved in farming it, rather than trading for fibers or textiles made elsewhere
− collecting for mats, cordage, etc
  − reeds, grasses, etc.
  − along with basketry, these artifacts are often studied by specialists who are not botanists
  − but they often will have a paleoethnobotanist identify the plants that provided the raw materials
− collecting architectural building materials
  − in the area where I work, two different cultures used different kinds of reeds to build their houses
  − why?
− ritual behavior involving plants
  − example: "offerings" of whole food or craft items in pits
  − example: layers of reeds in burial mounds
    − where did they come from?
    − what did they "mean"?
− example of changing fuel from the Mantaro Valley, Peru
  − this is a project that I worked on
  − Chris Hastorf and Sissel Johannessen
  − looked at charcoal from flotation samples
  − compared proportions of wood chunks, stem (twig) pieces, and grass fragments
  − found gradual decline in proportion of wood chunks, rise in proportion of twigs during Pancan periods
  − then shift to more wood in Wanka II and Wanka III (Inka) periods
  − they saw this as a decline in availability of wood through the Pancan periods, then the rise of tree farming with the appearance of local chiefdoms
  − they argued tree farming may have had symbolic as well as economic value for emerging elites
  − there are many reasons to be skeptical, but this does show how far some people may push paleoethnobotanical data
− how to count botanical remains?
  − similar problems as counting broken bone, but worse
    − you can’t possibly examine all the soil from a site under a microscope!
    − so paleoethnobotanists are always dealing with tiny, expensive samples of even a small feature like a hearth
    − we won’t go into the quantitative methods here
− there are various kinds of smaller plant remains
  − flotation samples, light fraction
    − these are usually just smaller seeds and broken plant parts
    − identified using magnification, but otherwise similar to macrobotanical remains
  − **phytoliths**: silica (opal) deposits that form mostly in the stems of arid-adapted grassy plants, but in some other cases as well
    − some can be identified as to what species of plant they come from
− others are ambiguous
− they are microscopic, but durable
− must be laboriously extracted from
  − soil samples
  − the surfaces of grinding stones
  − sometimes identifiable ones remain embedded in "sickle gloss" on stone blades used to cut thatch, harvest grain, etc.
− example: reconstructing what crops were grown on prehistoric agricultural terraces in the Osmore valley, Peru
  − work by Tony Ribiero
  − soil samples contained maize phytoliths (and some others; not yet published)
  − a different project recently did the same at a coastal site north of the Osmore valley
− **pollen**: the male gametes of flowering plants
  − often commonly included here: spores, which are "packaged" cells that disperse and later grow into plants
  − the study of pollen is **palynology**
  − microscopic, but durable
  − can be identified as to what species they come from
  − extracted from soil samples
  − also from "pollen washes" from the surface of some artifacts
  − have evolved specifically to blow around easily, so contamination is a constant worry
  − soil samples collect the "pollen rain" at the time the soil was at or near the surface
    − this reflects the plant mix in a fairly large surrounding area, depending on prevailing winds, etc.
    − good for general climatic and ecological reconstruction
  − example of mesolithic Star Carr, ~7500 BC
    − pollen indicated a birch forested environment while the site was occupied
    − and a dramatic change to elm, oak, and hazel just as the site was abandoned
    − climate or other environmental change related to abandonment?
  − pollen found in specific contexts like burials or storage rooms is sometimes taken to reflect the activities that happened there, rather than just the general environment
  − Shanidar cave example
    − flower pollen concentrated in areas around a Neanderthal burial suggested intentional, ritual burial with flowers
    − but maybe the pollen was from flowers dragged into burrows by a species of rodent (called a jird) known to have burrowed in the cave
    − not as bad as Kelly and Thomas say
    − there *were* samples from other areas of the cave deposits that had much less flower pollen in them
      − did the jirds only hide flower heads in this one spot, out of all the ones checked by the project?
      − so the original claim still seems fairly likely
  − Pampa de la Llamas, Huaca A example
- were the rooms for storage?
- very little evidence of what would have been stored there
  - not surprising; if it had any value, it would have been removed
  - pollen from niches suggests cotton, beans, potatoes, peanuts
    - but it could have blown in on the wind
  - pollen comes from flowers; it is not typically plentiful on the parts of plants that
    would be stored, like peanuts or potatoes
  - lots of rodent bones also suggest storage
- Combining these kinds of evidence can be very powerful
  - macrobotanical remains and flotation samples show what seeds and other edible parts
    were present
    - sometimes also what non-edible parts, stems, leaves, fuel, etc.
  - but in many sites, only carbonized (burned) plant remains survive
    - and mostly what gets carbonized is food being cooked, and fuel, not peels, stems, etc.
- phytoliths show what grassy stems were present
  - good only for some kinds of plants
  - these are parts that might or might not be collected and brought to a site
    - depending on what the people wanted to do with the plant
      - eat the seeds? make mats from the stems?
      - and how and where they processed it
- pollen shows
  - the general plant environment (usually)
  - presence of flowers (in special cases)
- so combining these might show that
  - seeds were harvested and brought back to the site (if expected phytoliths are absent)
  - a common plant was not used for some reason (if it is found in the pollen)
  - a plant was brought in from a long way away (if it is not found in the pollen)
  - etc.