

Introduction to Biological Anthropology: Notes 19  
**Lifestyles of the toolmaking Oldowan hominins**

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- The earliest known stone tools appeared in East Africa around 2.5 mya
  - the “Oldowan tool industry”
  - rounded cobbles that have had flakes broken off
    - sometimes with scars from removing just a few flakes, sometimes up to 30 or more
    - leaving the cobbles with sharp edges useful for cutting or pounding
    - these are called
      - “cores” when people think of them mostly as the leftover from making flakes
      - or “core tools” when we think of them as being tools themselves
    - but the thin, sharp flakes were probably more useful as cutting tools
    - also “spheroids”, now understood to be “hammerstones” used to bang off the flakes
  - what is the big deal with broken rocks?
    - hominins don’t have sharp canines or strong, sharp claws
    - imagine yourself hungry in the forest, surrounded by game
    - how are you going to make a weapon or trap without at least a pocket knife to cut and shape some branches?
    - or say you did catch and kill a deer. How will you get into it to eat the meat?
    - a sharp stone flake might be the difference between survival and starvation
- But which hominins made the stone tools?
  - there were several species of hominins around at 2.5 mya
  - recall that *A. garhi* was found with animal bones with cutmarks from stone tools
    - but that is not conclusive; why would the butchered animal bone and the butcher’s own bones be found together?
    - maybe a predator or scavenger was attracted to *A. garhi*’s butchery site and killed the hominin while it was butchering its catch
    - but the dead *A. garhi* was actually a victim of the true toolmaker, destined to be cut up itself for food
  - other possible toolmakers include
    - *A. africanus*, an otherwise typical australopithecine
    - *A. rudolfensis* (the late, unusually big-brained australopithecine)
      - that would require that the first *A. rudolfensis* appeared a bit earlier than our first fossil evidence of them
      - but recall that it isn’t likely that we have fossils of the very first of any species – any species probably appeared earlier than the first fossils of it
    - the hyper-chewer *Paranthropus aethiopicus*
    - a hypothetical descendant of *Kenyanthropus platyops*
    - earlier-than-known *Paranthropus boisei* or *Paranthropus robustus*
    - or maybe the first members of the genus *Homo* actually had already appeared by this time
  - paleoanthropologists used to argue a lot about which species was the first toolmaker
    - but the picture has now gotten so complicated that there is little point in worrying about it until some surprising find provides more clarity

- I agree with Boyd and Silk that we can just refer to “Oldowan toolmakers” or “Oldowan hominins” and not fret about which species they were
  - in fact, there probably were multiple species of toolmakers
  - making different kinds of tools for different dietary needs
  - at least one kind that made bone tools (probably *Paranthropus robustus*), and probably a different species that made stone tools
- Is it a coincidence that stone tools appeared at 2.5 mya, not long before the first definite members of our genus *Homo*?
  - The earliest known *Homo* appeared around 1.8 mya
    - bigger brain
    - modern-like long, slow juvenile development
    - modern-sized body, much bigger than *Australopithecus* and *Paranthropus*
    - modern-like minimal sexual dimorphism
  - These features presumably evolved among Oldowan toolmakers
    - whichever species they were
    - these changes may have been related to shifting to reliance on stone tools
- Boyd and Silk suggest that
  - stone tools are part of a complex foraging adaptation like that of modern human foragers, not like that of non-human primates
  - and that this adaptation led to natural selection that favored the development of the modern traits above
- Why?
  - Modern human foragers eat a very wide range of foods
    - hidden, deeply buried roots
    - ants inside cement-like anthills
    - meat from many animals that are hard to kill and hard to process
  - This gives humans access to foods that few other species can get
    - so there is less competition for these foods
    - and food of some sort will be available almost anywhere, anytime
  - But getting and processing these foods requires a lot of specialized knowledge
    - much more so than needed by any other primate
    - so modern human foraging takes many years to learn
      - human foragers don’t reach peak food production until their 30s or 40s
  - in primates that began using foods that required such complex behavior to find, get, and process, the most successful ones would be those with
    - better ability to learn and better memory: larger brains
    - longer time spent maturing that big brain and learning skills: long, slow juvenile development
  - which would pay off most for individuals with longer lifespan
    - since juveniles with immature brains generally don’t reproduce
    - so that period must be followed by a longer life in order to have reasonable reproductive success

- bodies that take longer to mature and that last longer tend to be larger
  - this is the “long, slow, large” life history strategy
  - which explains the modern features of early *Homo*
- But how can we explain the reduction in sexual dimorphism?
- Boyd and Silk argue that depending on behavior so complex that it takes much of a lifetime to master works best if
  - different individuals specialize in (becoming good at) certain tasks
  - and then those specialists share the products of their skilled labor
  - the first step would be sexual division of labor
    - females with infants cannot hunt as effectively as males, but can become skilled gatherers
    - males, lacking infants, can specialize on hunting and become effective at it
  - this only works if males and females share the different kinds of foods they produce
  - since specialized food-getting takes so many years to get good at, it also requires sharing across age groups
    - adults in their prime must share a lot of food with not only infants, but also young adults who are not very productive yet
  - another reason to expect extensive sharing among the first foragers: hunting is unreliable
    - any decent kill produces a lot of high-quality food in a compact package
      - it can easily be carried to a home base
      - so for hunters, sharing is relatively easy
    - but success is irregular
      - hunters usually get nothing at all
      - a single hunter could easily have a stretch of bad luck and starve
      - but a group of hunters that share their kills greatly reduces that risk
        - even if one is having a streak of bad luck, one of the others may get something
  - So complex foraging encourages sharing
    - between males and females with different specialities
    - between experienced, productive adults and younger ones
    - between hunters in order to average out streaks of bad luck
  - those groups that had less male-male competition would share better
    - allowing for greater specialization, leading to greater food productivity
    - surviving better and leaving more offspring
  - this reduction in male-male competition would reduce the selection for costly extra body size in males
    - reducing sexual dimorphism
    - perhaps favoring the human tendency towards long-term couples within larger social groups
      - maybe fostered by concealed ovulation, as we discussed weeks ago
  - overall, individuals who lived in groups and shared food would be much more successful than those that did not
- in short, making tools may be part of a whole suite of physical and behavioral changes
  - involved in shifting to complex foraging

- and leading to becoming human
- So: is there any evidence for Boyd and Silk's theory?
  - That is, were the Oldowan toolmakers becoming complex foragers?
    - Changing climate could have pushed them towards complex foraging
      - the world was getting cooler
      - from tropical forest with lots of varied resources
      - to savanna grasslands with patches of trees
    - also getting more seasonal
      - each year had a dry season when food would have been scarce
    - one response could have been to add more kinds of food to the diet
      - especially foods that other animals were not using
      - like those that can only be gotten by using complex techniques
        - like finding and digging up deep roots
  - One way to tell if early hominins actually adopted more complex food-getting techniques would be if we knew what the stone tools were used for
    - different kinds of use cause different kinds of use-wear
    - some use-wear studies suggest that Oldowan tools were used both to butcher animals and to shape wood
      - suggesting that the Oldowan toolmakers ate more meat than before
      - and made wooden tools, presumably for getting or processing other kinds of food
      - that is, this suggests complex foraging
  - as we saw last time, bone tools found with *P. robustus* in South Africa have wear suggesting they were used to dig into anthills
    - this would be one addition to the ways that hominins got food
    - but they are later than the stone tools
    - and associated with a different species, only in South Africa, that did not lead to *Homo* in any case
      - so it might not be fair to include them as part of a single, complex strategy of getting food
  - stone tools sites show that the Oldowan toolmakers ate meat
    - stone tools are often found in concentrations of animal bones
      - suggesting that they were used to process carcasses for meat
    - the animal bones do not suggest natural deaths
      - usually bones of one or a few animals, not a herd
      - often several different species at the same place
        - that is, these are not from natural mass deaths like a herd drowning in a river
        - hippos, elephants, giraffe, antelopes, gazelles, sheep, goats, wild cattle
    - with flakes, cores, and spheroids or other hammerstones
      - hammerstones are rocks that are struck against other stones to knock flakes off of them
    - the stones come from different sources, some several kilometers away: they were brought there on purpose
    - the animal bones often have cutmarks from stone tools on them
  - conclusions
    - these "sites" really are the traces of activities of early hominins

- the early hominins really did eat meat
- and they made and used stone tools to cut up carcasses
- but we don't know if this was common or a rare event
- nor how they got the carcasses
- does this meat eating imply hunting, or scavenging?
  - these hominins were not naturally equipped to hunt
    - small bodies, small canines, no claws...
  - but scavenging is not an easy option, either
    - you have to drive off the successful hunter and/or other scavengers
      - this can be very dangerous
    - scavenging is usually an unreliable strategy
      - dead animals are just not that common
      - you can't count on finding them consistently
        - except at certain seasons, if large migratory herds pass through your region
  - yet the Oldowan toolmakers clearly got and cut meat off these carcasses somehow
  - most mammals that hunt also scavenge sometimes
    - so it is reasonable to suggest that the Oldowan toolmakers might have done both
- Evidence from cutmarks
  - cutmarks are found on many different bones
    - some cutmarks are on the meaty limb bones
      - these are typically torn off and taken away by carnivores
      - suggesting that the hominins either hunted the animals themselves
      - or got there immediately and took the limbs away from the successful hunters – a scary prospect
    - other cutmarks are on the vertebrae, ribs, and crania
      - these are the second-rate parts that carnivores tend to leave behind
      - suggesting that the hominins scavenged after the hunters had left
    - so this evidence suggests that the Oldowan toolmakers did some of both:
      - scavenging old carcasses after the hunters had gone
      - either hunting themselves or taking fresh kills away from hunters
  - sometimes cutmarks cross over animal tooth marks
    - suggesting that the hominins cut up the remains after the carnivores left
  - sometimes animal tooth marks cross over cutmarks
    - suggesting that the animals scavenged what the hominins left behind
  - again, this evidence suggests that the Oldowan toolmakers did some of both:
    - sometimes scavenged carcasses after the hunters had left
    - sometimes hunted or took fresh kills away from hunters
- early hominins could have had a mixed approach
  - mostly counting on plant food
  - plus scavenging, maybe hunting, when they could
- early hominins might or might not have used "home bases"
  - a "home base" would be something like a campsite

- a place to which carcasses or parts of them were brought to be cut up, shared, and eaten by a group of early hominins
- like modern foragers, the early hominins might have lived in these places, making tools and interacting socially
- like the camps of modern foragers, they would have been simple and temporary
- if early hominins did use home bases, that would be a clear step in the direction of modern human-like behavior and social organization
- argument in favor of home bases
  - one bone-and-tool site in Olduvai gorge has a ring or cluster of stones that might have been formed by the construction of a shelter or nest
- arguments against home bases
  - some bones have both carnivore and stone tool marks, in both orders
    - this suggests that carnivores were at these sites before, after, and maybe even during the time that the hominins were there
    - this would not be very good for a campsite!
  - sites include a relatively high proportion of carnivore bones
    - compared to the collections of bones left at kills by non-human carnivores
    - this suggests that the early hominins sometimes killed carnivores at these sites, probably in fights over scavenging the meat
    - this is believable, since modern kill sites are often scenes of fights between carnivores
      - again, not a place to hang out or take a nap
  - some of these sites have hominin bones in them, too
    - sometimes with carnivore tooth marks on them
    - suggesting that sometimes the hominins lost the fights with other carnivores
    - again, not the scene we expect of a comfy home base
  - the bones at these sites show different degrees of weathering
    - some were exposed to the elements for years, while others were not
    - this suggests that carcasses were brought to the sites repeatedly over a span of up to 4 to 6 years
    - this does not correspond to typical carnivore kill sites or places where animals just happened to die
      - that is, not what you would expect at places where scavengers found meat
      - both would be in a different place each time, not repeatedly at certain spots
  - but it also does not match with modern foragers' camps
    - modern foragers typically move from place to place frequently
      - they stay at a camp for more than one meal
      - but not a long time
      - you would not want a big rotting carcass in your campsite for the week, attracting dangerous scavengers
    - modern foragers typically do not return to the exact same spot over and over again
      - especially not within the first few years, before the garbage has decayed, the insects subsided, etc.
  - the bones are not fully processed

- modern foragers smash up bones much more in order to get all the meat off and the marrow out, often boiling the bones
- the bones from the early hominin sites have been hurriedly processed, with mostly the best chunks of meat and sinew cut off
  - suggesting that the hominins got the high-value pieces off the carcasses and left, rather than hanging around as at a home base
- an alternative explanation for the sites: tool caches
  - Rick Potts' theory, now the generally preferred explanation for these sites
  - early hominins cached small piles of tool material around the countryside
    - the stone found at sites is often from many kilometers away
  - when they killed or scavenged something, they would take the carcass to the nearest tool cache and quickly butcher it there
  - carrying the meat off somewhere safer to eat
  - the sites would be butchery places, but not camps
  - this is not as crazy as it sounds
    - you can't leave a carcass to go get your tools
      - because some other carnivore will scavenge it
    - you don't want to carry heavy stone tools around with you all the time just in case you find a carcass
      - especially if you would have to have them in your hands all the time because you are not yet able to make bags, etc.
  - this would require some advance planning, memory of where the caches were, and decisions about where to go with meat, and so on
    - chimps leave hammerstones near big flat rocks or protruding roots for cracking nuts in the forest, so this level of thinking would presumably not have been beyond the early hominins
    - chimps will go get a familiar hammerstone to break nuts with, going to the closest one.
      - not identical behavior, but it involves a similar degree of memory and reasoning
- Conclusions
  - the Oldowan toolmakers were probably complex foragers, starting to resemble modern human foragers
    - probably used a wide range of complex extractive techniques to get a wide range of different foods
      - that required very complex extraction and processing
      - including methods involving stone tools, bone tools, and wood tools shaped with stone ones
      - and a complex method of caching stone tools and/or toolmaking material around the landscape and hauling carcasses to these caches for butchery
  - probably foraged for wide variety of plants
  - also sometimes scavenged meat and possibly sometimes hunted
    - we can't tell whether the hunting and/or scavenging indicated by a few known sites was a major part of their diet, or a very rare bonanza

- and the importance of this in directing evolution is also still unknown, although it might have been very important
- this complex extractive foraging adaptation would probably encourage new social behavior
  - probably lived in large, multi-male, multi-female groups
    - because earlier hominins like *A. afarensis* did
    - and because they initially had strong sexual dimorphism, expected in multi-female groups with one or more males
  - sexual division of labor (specialization)
    - allowing males to learn complex hunting skills and females to learn complex plant location and extraction skills
  - probably with lots of sharing
    - sharing between males and females
    - sharing across ages, not just with small offspring
  - reduced male-male competition, maybe long-term mate pairing
    - in order to make the necessary sharing possible
- Boyd and Silk argue that this would create natural selection pressures for the characteristics that would mark early *Homo*
  - large, slow, long life-history strategy
    - larger brains
    - larger bodies
    - long juvenile development and learning period
  - reduced sexual dimorphism