Middle to Upper Paleolithic Transition
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When we look at the trend in Hominin evolution, there is clear directional selection for increasing brain size. Cranial capacity increases from about 415cc in *A. afarensis* to about 1350cc in *H. sapiens sapiens* (you and me). At first glance evolution of the human brain appears to coincide with increasing cultural and technological sophistication, but how true is that impression?

Lower Paleolithic

The Lower Paleolithic begins about 2.5 million years ago with simple broken rocks in the Oldowan industry. It’s difficult for the untrained eye to identify these broken rock tools, but analysis shows that they are broken (flaked) in a non-random pattern. Such tools would have been useful for breaking open bones to extract marrow etc.

http://lithiccastinglab.com/gallery-pages/oldowanstonetools.htm

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Around 1.5 million years ago a new kind of industry developed from simple Oldowan tools. This industry, known as the Acheulean, is typified by one type of tool: the biface hand axe.

Now this tool really looks like something potentially useful. In fact the Acheulean hand axe was perhaps the most successful tool ever used. *Homo ergaster* and/or *erectus* made this tool for over a million years as did later members of the *Homo* genus. *H. erectus* made hand axes everywhere they could find the appropriate kind of stone to make them, and there was no stylistic variation. Hand axes in the Middle East look like hand axes in Europe and Africa. There seemed be little cultural variation.

The “tear-drop” shape of these hand axes is an important feature. Interestingly the hand axe has the same tear-drop shape from any angle. Some archaeologists suggest that the shape and form of the hand axe was “hardwired” in the brain of early *Homo* much like the ability to make a particular kind of nest is hardwired in bird brains.

Note that the style and form of hand axes were consistent for a very a long time over a wide geographic range; in contrast hominin brains were dramatically increasing in size over the same time period. This gap between technology and brain size suggests that factors other than the need for technical sophistication were driving hominin brain evolution. What might those factors have been?

*Middle Paleolithic*

There was a modest increase in technological sophistication associated with the Middle Paleolithic (in Europe) or Middle Stone Age (Africa) around 200 to 300 KYA. Middle Paleolithic (MP) technology was clearly developed from and based on the Acheulean industry. For example, in Europe the industry associated with Neanderthals and early Anatomically Modern Humans (AMH like us) is called “Mousterian of...
Acheulean Tradition.” The Mousterian industry still uses hand axes, but MP people added other new tools to their kit.

http://www.hf.uio.no/iakh/forskning/sarc/iakh/lithic/MOUST/mousterian.html

Animations of MP tool manufacture:
http://archserve.id.ucsb.edu/Anth3/Courseware/LithicTech/8_Middle_Paleolithic_Tool.html

When AMH first arrives in Europe they are still using these kinds of MP tools. There is no real visual art and tools are still primarily utilitarian rather than highly crafted or stylized. There was one important innovation called the Prepared Core technique.

http://donsmaps.com/makingflinttools.html

Animations of UP tool manufacture:
http://archserve.id.ucsb.edu/Anth3/Courseware/LithicTech/9_Upper_Paleolithic_Tool.html

In the prepared core method you start with a rock or cobble, then strategically remove a series of flakes to “prepare the core.” Once the core is prepared, you can easily knock off a series of sharp blades that can then be turned into other tools or used as is. The advantage of the prepared core technique is that it yields more cutting edge per pound of stone than does Acheulean or Lower Paleolithic technology – it’s more efficient. The right kind of stone for making tools is sometimes hard to find, so using foresight to efficiently manage limited resources (like good stone) gives one an advantage.

Upper Paleolithic Transition in Europe

Even with the advantage of prepared core tools, the MP is not that much different from the LP. It’s still a relatively simple kind of technology based on few types of tools made almost exclusively from stone, with limited regional variation. This is how things were when we (Anatomically Modern Humans aka AMH) came on the scene somewhere around 100,000 years ago. In Europe AMH lived much like Neanderthals and they lived along side them in many areas. They both hunted the same animals with same kind of tools, though they may have lived in different kinds of sites. That’s how things were for about 60,000 years, but at 40 KYA something new and dramatic began. We call this the Upper Paleolithic (UP) transition. (We focus on Europe because the archaeological record is relatively good there, but the transition was occurring all over the old world, not just in Europe.)

Suddenly (at least in an evolutionary sense) AMH began making new types of tools and we began using different kinds of materials. Bone tools show up for the first time, like the harpoon points illustrated below.
There are also new types of stone tools and their manufacture show new considerations. For example, some of the leaf shaped points below are wafer-thin and were clearly intended as projectile points rather than the kind of clunky thrusting spears used by Mousterian people. Some archaeologists believe that AMH began to give more consideration to the quality of stone: Most Neanderthal stone tools are made from materials available within a few kilometers of the manufacture site. Upper Paleolithic AMH, however, appears to have traveled 100 kilometers or more to obtain slightly better quality flint for stone tools.

There are other new inventions in the Upper Paleolithic, like the atl-atl or spear thrower depicted below. These spear throwers increase the speed, force, distance and accuracy of projectiles. The atl-atl shows a clear understanding of the concept of torque. There is also evidence of bone sewing needles and tailored clothing for the first time.

Along with these technological advances, came great innovations in artistic expression. The UP transition brings the first great works of art to the world, including the remarkable cave paintings in Southwest Europe and the small "venus figurines" depicted below.
We also see the first evidence that people were decorating their bodies. We find Upper Paleolithic necklaces and what appear to be tattoo kits, like the one shown above. The UP also marks the beginning of the kind cultural variation that we see today. UP populations showed stylistic variation over time and geographical distance. In the UP pace of cultural evolution picks considerably, a trend that seems consistent for all subsequent human history up to today.

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<thead>
<tr>
<th>Culture</th>
<th>Time period</th>
<th>span</th>
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<tbody>
<tr>
<td>Acheulean</td>
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The Upper Paleolithic transition seems to mark a change in the human mind-set. People now are projecting value onto objects in ways they never had before. A spear point is not just a tool in the UP, but its also an expression of craftsmanship that was not present before. Humans begin to use visual media to signal things about themselves in very new ways. There is no way of knowing whether or not Neanderthals may have had a rich expressive culture, perhaps through song or dance, that would not be preserved in the archaeological record, but it is clear the AMH after 35,000 years ago begin to express themselves through objects in a completely new way. Perhaps this puts the origin of consumerism (or at least the psychological architecture for consumerism) in Upper Paleolithic transition.

If we compare the trend in cranial capacity to the trend in cultural evolution, then a very interesting picture emerges. Increase technological sophistication is not closely associated with increased cranial capacity. Anatomically modern humans (AMH), like us, emerged about 100,000 years. But we were living very much like Neanderthals in Europe or other archaic H. sapiens elsewhere for about 60,000 before we became so creative. What happened to drive the explosion of culture in the Upper Paleolithic? Some anthropologists think that there may have been a kind of arms race that drove cultural evolution and brain evolution. There was strong selection in favor of the ability to think in more complex ways that ultimately resulted in the kind of abstract thinking necessary for art and invention. That selection may have been the result of deadly competition between hominin groups. When the stakes are really high (life or death), then the cost of stupidity and the advantage of being relatively more intelligent are tremendous. This called the "ecological dominance-social competition hypothesis." Other people suggest that our creative revolution was the result of sexual selection: Creativity may be an honest signal of male genetic quality that would attract females, similar to a peacock’s tail. If that were true, then we might expect more sexual dimorphism in human creativity, but that does not appear to be the case – women are obviously just as creative as are men. Other anthropologists think that the creative explosion may have been the result of a critical mass in the accumulation of cultural knowledge. Once there was a significant body of knowledge to draw on, then an explosion in creativity became possible.

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<th>Time Window</th>
<th>Mousterian</th>
<th>Châtelperonian</th>
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http://public.wsu.edu/~rquinn/mptoup.htm