MINNIEAPOLIS
Back away from the leopard. Slowly.
Articles Posted: 327 Links Seeded: 1976
Member Since: 5/2007 Last Seen: 12/19/2010

Visit MinnieApolis's column >>

The Hyoid Bone and the Capacity for Speech in Hominids and Apes

News Type: Other — *Wed May 14, 2008 12:13 AM EDT*

science, speech, human-evolution, anatomy, apes, neanderthal, physiology, hominids, babels-dawn, hyoid-bone
By MinnieApolis

The appearance of the hyoid bone in the humanoid fossil record occurred possibly 800,000 years ago. How this affected human speech, or at least the potential for human speech, can be inferred by the differences between the hyoid bone in modern humans, Neanderthals, and the great apes.

Let us first describe the hyoid bone. The hyoid bone is horseshoe shaped bone, really more cartilage than bone, that sits atop our voiceboxes which in turn sit on top of the trachea. It is unique in that it is the only bone in our anatomy that is not directly attached to the rest of the skeleton. It is attached only by ligaments and muscles (BoneClones.com 1995-2008).

In chimps, one of our closest relatives, the hyoid (as well as the larynx) descends in the newborn. But only in newborn humans does "the hyoid descend in relation to the lower jaw and cranial base" (op cit). In other apes, it is believed that the hyoid bone does not descend (PubPages.UNH.edu undated). Neanderthals have a smaller tract with a hyoid bone that is midway in appearance between the chimp and human, and humans also have a lower larynx (op cit). The conventional view was that speech arrived as part of our cultural and physical heritage only in the past 100,000 years with the arrival of Homo sapiens sapiens (Bunney S. 1989). That view is now in dispute.

However, in a fascinating archaeological discovery, a fossil bone unearthed in Israel suggests that Neanderthals (who lived about 50K to 60K years ago) may have been capable of speech as well as modern humans. The delicate, partly cartilaginous hyoid bones are rather rare finds. This hyoid, excavated in 1983, was from an adult male Neanderthal.

Jeffrey Laitman of Mount Sinai School of Medicine, New York, believes that speech began developing with Homo erectus about 1.5 million years ago (Bunney S. 1989). Over the course of another million years, the hyoid and the rest of our vocal toolkit took on its present form. Neanderthals were always thought to be rather behind in vocal development compared to sapiens (Falk D. 1975), a bit like rednecks to the Brahmin-like sapiens.

But much to the surprise of anthropologists, this Neanderthal hyoid was just like a modern human hyoid.

In general, the progression of the pre-hominid hyoid and the modern hyoid involves losing a cup shape in the middle, according to Dutch linguist Bart de Boer. This cup indicates the presence of air sacs, used by apes (and many other animals) to produce louder percussive and even booming noises. The howler monkeys are especially well adapted to use their resonating sacs increase the volume of their calls (Bushnan, J. S. 1854). All apes have the cup shape and that feature is lacking in the human hyoid. Modern hyoids are now known (or thought) to be common to modern sapiens, Neanderthals, and even Homo heidelbergensis of 800,000 years ago (Bolles, E.B. 2008).

This leads to more than speculation about the larger range of sounds possible once one is not limited to hoots and grunts. As Bolles says in his blog, Babel's Dawn:

> *"But what evidence is there that the loss of air sacs might be related to the rise of speech? De Boer has modeled the sounds that follow the addition of an air sac to the vocal system. Air sac result in lower frequency sounds and a smaller acoustic range than humans enjoy. Air sacs shorten the articulatory range and the mouth is less able to shape the sound that comes out from an air sac vocalization. De Boer hypothesized that when what you say becomes more important than how you sound, air sacs give way. So the disappearance of air sacs is likely a good bit of evidence that speech of some sort has appeared (Bolles E.B. 2008)."*

So at this point it seems safe to conclude that the modern hyoid bone was key to expanding our vocal capabilities, aiding our progression from apes who communicated with hoots, grunts and gestures to the modern electronic sapiens who communicates with email and iPhones.

SOURCES:
Bolles, E.B., Fossil Evidence of Speech?, **http://ebbolles.typepad.com/babels_dawn/2008/03/fossil-evidence.html,** 2008.
Bone Clones, **http://www.boneclones.com/KO-102.htm,** 1995-2008.
Bunney, S., Neanderthals Weren't So Dumb After All, New Scientist, 1989.
Bushnan, J. S., The Principles of Animal and Vegetable Physiology, Blanchard and Lea, **http://books.google.com/books?id=ZQaJRgM95ZIC&pg=PA205&lpg=PA205&dq=hyoid+bone+apes&source=web&ots=MFVgK5J4l9&sig=Y4MAsg4i6VZYYEEYF9A4hK** 1854, pp. 173, 185, 205.
Falk, D. - Comparative anatomy of the larynx in man and the chimpanzee: Implications for language in Neanderthal, American Journal of Physical Anthropology, 1975.
PubPages.UNH.edu, **http://pubpages.unh.edu/~jel/712/Ape_neander_homoS.htm,** undated chart.

Back To Top | **Front Page**

Published to:

- **MinnieApolis's Column**, All of Newsvine
- Groups: **ArchaeoVine**
- Regions: none

Public Discussion (10)

MinnieApolis

I had to do a mini-paper for an anatomy class, and decided to post it here after getting it back. This is just a summary of our current understanding of the evolution of speech from apes to Neanderthals to modern humans. (AKA hominids)
Enjoy.

#1 - Wed May 14, 2008 12:15 AM EDT REPLY 3 votes

backroads

Well, darn, Minnie. Nothing shows up. Maybe later.

I did want to ask whether you think the modulations of whales constitutes speech.

Are you studying medicine?

#1.1 - Wed May 14, 2008 1:25 AM EDT 3 votes

MinnieApolis

RE whales and whether their song is true speech --
I made a search and according to a **story on PhysOrg**, the answer could well be Yes.

> *Until now, only humans have demonstrated the ability to use such a hierarchical structure of communication. The research, published online in the March 2006 issue of the Journal of the Acoustical Society of America, offers a new approach to studying animal communication, although the authors do not claim that humpback whale songs meet the linguistic rigor necessary for a true language.*

> *"Humpback songs are not like human language, but elements of language are seen in their songs," said Ryuji Suzuki, a Howard Hughes Medical Institute (HHMI) predoctoral fellow in neuroscience at Massachusetts Institute of Technology and first author of the paper.*
>
> *With limited sight and sense of smell in water, marine mammals are more dependent on sound--which travels four times faster in water than air--to communicate.*

The whale songs are longer and more complex than bird songs, and cannot be analyzed using the same tools. Suzuki wound up using information theory to analyze their structure.

#1.2 *- Wed May 14, 2008 7:15 PM EDT* 3 votes

REPLY

O-K

Everything we must know about the hyoid bone. Thanks.
Actually a very interesting article but a terrible side effect of this evolutionary development is that we have to listen to politicians.

#2 *- Wed May 14, 2008 9:24 AM EDT* REPLY 3 votes

MinnieApolis

Darn it, O-K, you hit the nail on the head of the downside of this evolution thing! You have a gift for that, you notice that?
However, due to the fact of having opposable thumbs, we can stuff our ears with cotton or earplugs, or earbuds connected to our iPod. Fortunately, human evolution has provided certain compensations for unforseen side-effects of other evolutionary advances.

#2.1 *- Wed May 14, 2008 6:52 PM EDT* 2 votes

O-K

Thank God for compensatory evolution.

#2.2 *- Wed May 14, 2008 8:31 PM EDT* 3 votes

MinnieApolis

There ya go --

#2.3 *- Wed May 14, 2008 9:08 PM EDT* 1 vote

REPLY

O-K

OK

#3 *- Wed May 14, 2008 10:10 PM EDT* REPLY 1 vote

getgreen *Deleted*

MinnieApolis

It isn't that the air sacs became obsolete. The air sacs had to go in order for modulation of vocal sounds to be possible. Now, as to HOW that happened, we could assume that random mutation happened, or that high levels of solar radiation caused a mutation, or some mysterious other cause.

But I personally believe that evolution is continually throwing random changes into the mix just to see if any of them prove to be advantageous to the survival of the species.

#4 *- Fri May 16, 2008 1:39 AM EDT* REPLY