The Human Larynx

One price of loving language is that there are always more books to read than time to do the reading. I've only now gotten around to reading *Freedomland*, a novel by Richard Price that was all the buzz in 1998, I noticed this bit of dialog:

"Jose." His name was as natural in her mouth as a cough.

It got me thinking about the FOXP2 gene (discussed here) that fine tuned control over the lower jaw. One of the things we can do with that lower mouth is cough and clear our throat more easily than people without the mutation. It seems a trivial task compared with speaking precisely, but one peculiarity of human anatomy is the way our windpipe (trachea) and esophagus are available to each other. The system allows us to speak, but at the risk of choking to death, so we have had to evolve special solutions to the risk while waiting for the invention of the Heimlich maneuver.

Chimpanzees, of course, do cough (even lungfish can cough) and I am guessing they even spit out phlegm from time to time. But choking to death on food? Among primates, only we humans seem to be so lucky. The reason for the problem is that the human larynx has moved from its position in the lower part of the mouth where, in animals, it seals off the trachea as food and drink is swallowed.

The larynx works like a valve, opening and closing to let air pass. When it is shut, food can pass into the esophagus at no risk to the lungs. The best place for such a seal is right at the top of the trachea so that no food or drink accidentally goes even a little ways down it, but humans have a second use for the valve. We work it like a musical instrument shaping the sounds made by passing air as we speak. The musical valve works best if we pull it a bit down into the trachea so that the air wave shaped by the larynx can resonate before leaving the mouth.

At birth the human larynx is in the normal, animal location, enabling babies to nurse without risk of choking. The larynx typically begins to move lower at about three months of age and reaches its final position by age four. People familiar with children's speech will notice that the start of the relocation is also when infants start to *coo*. The end is about the time the children finally become clearly intelligible to well-meaning strangers. The lowered larynx lets humans produce a much wider variety of sounds, particularly vowel sounds, than apes can generate.

It is a bit too literal-minded to assume that the movement of the larynx in infants born today mirrors the descent of the larynx over evolutionary time, but certainly there was some sort of descent and knowing the details of that transformation would be extremely informative.

We assume, but do not know, that the larynx descended to its present adult position over many generations. If that slow pace is correct, it was probably a long time before a clear

phonetic benefit was notable. So the change would have begun and been pushed by natural selection for some reason other than speaking clearly.

In adolescent males the larynx undergoes a second descent, producing the characteristic deep, male voice. This transformation also explains why men's Adam's apples are so much more prominent than women's. This change was probably sexually selected, with ancestral females preferring deeper voices.

Why would they prefer deeper voices? Possibly because in other primates the deeper the voice the larger the animal. Although human males are generally larger than human females, the difference is much less notable than in ape species. As the size difference between genders became increasingly insignificant, the sexual appeal of the old, more masculine voice difference *might well* have (NB the cautious tense) become more important.

This notion suggests a scenario:

- For undetermined reasons the differences between the sizes of the sexes (sexual dimorphism) in our ancestors began to diminish.
- In order to maintain the sexual appeal of the increasingly similarly-sized male, the male larynx began to lower, keeping the old, deep, male voice. (In other words, the adolescent larynx change is older in the evolutionary story than the infant's larynx change.)
- With their lower larynx, males began to acquire phonetic abilities that gave them a vocal range that was hard for females to imitate.
- In order to maintain the cross-gender ability to make all speech sounds, the larynx of infants of all genders began to descend.
- The final result was a species that undergoes a dramatic change in the organization of its vocalization organs.

The chief surprise of this scenario (besides the reverse in order of larynx descents) is the catch-up role assigned to females. Most evolution speculations imagine a lead role for the female, and (as readers of this blog over time will see) this blog too suspects that females were central pathbreakers in the rise of speech. But the origins of true speech was a very complicated process and surely different parts of the story deviated in one way or another from any general themes.

Also, there is no reason to assume that speech (of a clumsy and restricted kind) did not begin until after the larynx began to descend. Indeed, this scenario implies that there was some kind of meaningful vocalization going on prior to the descent; otherwise, the increased flexibility on the part of males would be of no importance.

The value of a scenario is the same as that of a hypothesis: it gives us things to look for. In this case, we can look for:

- *Signs that the decrease in body-size differences and descent of the male larynx were part of the same process*. The fossil evidence seems to put the decline of body dimorphism based at about 2 million years ago, with the appearance of Homo in the fossil record. Is that when the male larynx began to descend? Unambiguous answers may be a long time coming, but clues might appear if qualified people looked for them.
- *Evidence the adolescent's larynx descent preceded the descent of the infant larynx*. Fossils might provide some ambiguous answers, but a more likely source will probably have to await understanding of the genetic control of these two processes. Then we can, perhaps, determine which genes are older.

The appeal of a scenario like this is the way it links two human peculiarities (reduced sexual dimorphism and elongated vocal tracts) into one story. It is quite remarkable that two-million years ago body size between the two genders became less pronounced, implying some move away from sexual competition between males at even that early date. If it turns out that the same time saw the evolution of the human vocal tract, it would be strong evidence that the humanization of our ancestors was already well underway.

On the other hand, if there was a physical evolution that carried the risk of choking two million years ago, and a genetic mutation that made it easier to clear the throat only two hundred thousand years ago, how many of our pre-FOXP2 ancestors choked to death?