# Skull canals spark speech-origins dispute

Fossil indications of whether Neandertals and other prehistoric populations were capable of talking have proven scarce and subject to conflicting interpretations. The hypoglossal canals, a pair of bony tubes located on the left and right sides of the skull's base, were nominated just last year as skeletal signposts of speech.

These cranial passages carry branches of a nerve that activates all but one of the tongue's muscles. However, they bear no telltale traces of an individual's anatomical readiness to speak, according to a new study.

The findings challenge a proposal that relatively large hypoglossal canals in the skulls of human ancestors who lived about 400,000 years ago reflect their ability to talk much like people do today (SN: 5/2/98, p. 276). In that report, Richard F. Kay of Duke University Medical Center in Durham, N.C., and his coworkers asserted that hypoglossal canal size relative to mouth size averages about twice as large in humans, Neandertals, and some early *Homo* species as in chimpanzees.

Growth of the hypoglossal canals in the human lineage may have accompanied a thickening of the hypoglossal nerve to coordinate tongue movements needed for speaking, Kay's group theorized.

David DeGusta of the University of California, Berkeley and his colleagues disagree. Many prosimian, monkey, and ape species have hypoglossal-canal–mouth ratios that reach or exceed the modern human range, DeGusta's team reports in the Feb. 16 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

Hypoglossal-canal–mouth ratios in skulls from two early species in the human evolutionary family, neither of which is thought by anthropologists to have spoken, also fall within the modern human range, the scientists say.

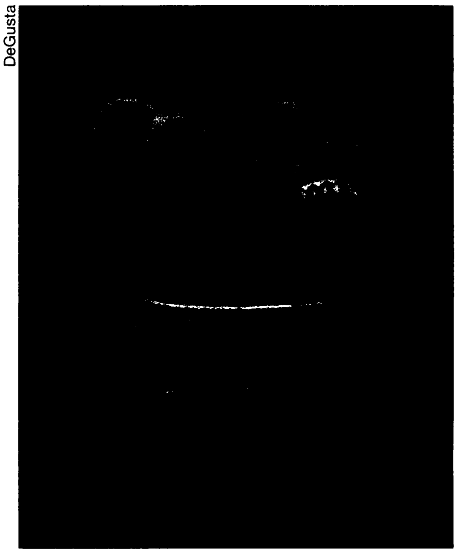
"I think it's pretty clear that hypoglossal canal size has nothing to do with speech," DeGusta says. "The date of origin for human language and the speech capabilities of Neandertals remain open questions."

DeGusta and his team measured the hypoglossal-canal–mouth ratios from skulls of 104 modern humans, 75 nonhuman primates from more than 30 species, and 4 pre-human australopithecines from species dating to 3.2 million years ago. Dissections of five modern human cadavers also yielded no indication that larger hypoglossal canals carry thicker hypoglossal nerves.

The new report provides interesting data on variability in hypoglossal-canal–mouth ratios within species but leaves unexplained the canal's larger average relative size in humans and Neandertals compared with chimps, asserts Kay.

Ranges of hypoglossal canal size vary so much that comparisons of average ratios can offer little insight, DeGusta responds. For instance, he says, some chimps have hypoglossal canals that are proportionately three times as large as those of some modern humans, although only the people speak their minds. —*B. Bower*

DeGusta



*Partial skulls of a capuchin (left) and a howler monkey rest inside a modern human skull. Both have larger hypoglossal canals (not shown) than the human.*

# Decays may reflect matter-antimatter rift

The concept of symmetry lies at the heart of particle physics. Symmetry requires that interactions of particles produce the same outcomes under changed conditions—say, when reversed in a mirror or rotated in space. When breaks in symmetry occur, they speak volumes about the profound nature of the particles and their environment.

A 1964 experiment shocked physicists with its revelation that some particles known as K mesons would follow an altered pattern of decay if swapped with their antiparticles and reflected in a mirror. The unexpected outcome shattered fondly held notions that this composite symmetry always prevails.

Now, the first exhaustive analysis of decays of particles known as B mesons indicates that Ks are not alone. In the lingo of physicists, B particles, like Ks, may also "violate CP symmetry," where C, or charge, refers to the particle-antiparticle transformation and P, or parity, refers to the reflection in a mirror. Physicists had already suspected that B mesons would show CP asymmetry because Bs and Ks are built from fundamental particles called quarks, which are thought to be the asymmetry's source.

Differences in behavior between Bs and anti-Bs may illuminate one of nature's most notable asymmetries: that the universe is made up nearly entirely of matter. Cosmologists believe that the universe was born with equal amounts of matter and antimatter, but a slight asymmetry in the laws of physics led to matter's dominance. Asymmetries for K and B decay enable physicists to calculate a parameter that predicts the cosmological disparity.

The prevailing model of particle physics, which appears to account for the asymmetrical decays of Ks and calls for asymmetry in certain B meson decays as well, falls short of predicting the observed disparity. This raises the tantalizing possibility for scientists that careful studies of other modes of B meson decay might expose cracks in the so-called standard model of physics, which has held sway for 20 years.

Researchers from the Collider Detector at Fermilab (CDF) project at Fermi National Accelerator Laboratory in Batavia, Ill., announced on Feb. 5 that they have found a large imbalance in decays of Bs versus anti-Bs. They studied 400 so-called golden mode decays recorded during their 3-year experiment. Assigning the degree of asymmetry a number between 0 and 1, where 1 is maximum asymmetry, they came up with 0.79.

"That's huge," says Kevin T. Pitts, one of the Fermilab scientists.

In golden mode, a B or an anti-B disintegrates into two particles, one known as a J/psi and one as a K-short. The mode happens to be one for which physicists consider the standard model's predictions robust. The measured asymmetry is "coming in right where you'd expect," says Michael Witherell of the University of California, Santa Barbara.

The researchers who analyzed the decays—Pitts, Nigel S. Lockyer, and Joel Heinrich of the University of Pennsylvania in Philadelphia—stress that their findings, while suggestive and encouraging, fall far short of proving that Bs violate CP symmetry. Although their data set ranks as the biggest so far, it is small for ensuring accuracy, so their measurement could err substantially.

We found "an indication of CP violation in the B system," says Lockyer. "The error is not small enough to say 'discovery.'"

"It's a good experiment, well carried out. There just wasn't enough data," comments Karl Berkelman of Cornell University.

Researchers are plunging ahead worldwide with large-scale B meson investigations. Given the huge commitment of money and talent, the CDF findings send a reassuring signal. Says Lockyer, "We're getting a hint here that probably the right choice has been made." —*P. Weiss*