Brain scans seek roots of imagined voices

Many people suffering from schizophrenia endure periods in which they hear disembodied voices, often uttering such scathing comments as "You're worthless" or "No one likes you." Hallucinations of this kind are amplified by breakdowns in two areas of the brain that monitor the nature and source of what one says silently to oneself, a new study suggests.

"A predisposition to [hearing voices] might depend on abnormal activity in brain areas implicated in perceiving inner speech and in determining whether it is of self or alien origin," contend Philip K. McGuire of the Institute of Psychiatry in London and his colleagues.

Researchers have assumed that auditory hallucinations arise when a person lacks conscious awareness of verbal thoughts as they occur or attributes such thoughts to someone else. McGuire's group offers clues to the biology of these errors. Defective communication between a brain region fostering the "mind's voice" and another abetting the "mind's ear" underlies the experience of hearing disembodied voices, in their view.

Schizophrenia, a severe disruption of thought and personality that stems from poorly understood brain disturbances, often includes hallucinations and delusions. Social withdrawal, apathy, and incoherent trains of thought also feature prominently in this condition.

McGuire's group used positron emission tomography (PET) scans to measure blood flow in the brains of six men diagnosed with schizophrenia who frequently heard voices, six schizophrenic men who had rarely or never heard voices since their illness began, and six healthy men who had never heard voices and had no psychiatric disorders in their families.

The researchers obtained PET scans while participants mentally recited a series of written sentences in their own voice and when they imagined a second set of sentences being spoken by an unknown voice they had previously heard on a tape. No one suffering from schizophrenia hallucinated during the experiment.

The three groups displayed comparable blood flow patterns throughout their brains while thinking of sentences in their own voice. However, when imagining sentences in another person's voice, hallucinators showed reduced blood flow in the supplementary motor area (SMA) and the left middle temporal gyrus (MTG), the scientists report in the Sept. 2 LANCET. In contrast, nonhallucinators and controls exhibited roughly equal blood flow boosts in those areas during the same task.

The SMA helps to initiate movements needed to speak. Reduced blood flow in the SMA of hallucinators imagining someone else's voice may block the "mind's ear" and create a "less secure appreciation" of where the voice originated from, McGuire and his coworkers argue.

The left MTG helps to monitor the "mind's voice," they contend, since it livens up on tasks that require thinking about speech but calms down during talking. Lowered activity in this area for hallucinators imagining another's voice suggests that their brains respond as if they were speaking aloud, the scientists assert.

It remains unclear whether the observed brain changes predispose hallucinators to hearing voices or simply take part in hallucinations and tasks that simulate them, such as imagining another's voice, cautions Richard Jed Wyatt, a psychiatrist at the National Institute of Mental Health's neuroscience center in Washington, D.C. *—B. Bower*

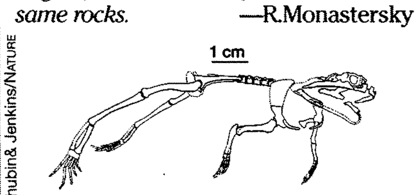
The jumping frogs of Coconino County

Two paleontologists have discovered the oldest fossil frog to date, shedding new light on how these amphibians evolved their jumping prowess. The new species, Prosalirus bitis, *hails from Coconino County, Arizona. Neil H. Shubin of the University of Pennsylvania in Philadelphia and Farish A. Jenkins Jr. of Harvard University describe the 190-million-year-old specimen in the Sept. 7 NATURE.*

Unlike protofrogs from the earlier Triassic period, this Prosalirus *skeleton's pelvis is designed for transmitting the jumping force of the hind limbs to the rest of the body. The tail of its amphibian ancestors evolved into a short bone that fits entirely inside the pelvis.*

The discovery of such an ancient frog in North America upends the idea that frogs first developed and diversified in the southern continents.

According to Shubin, the ability to jump may have benefited the 5-centimeter-long Prosalirus *by enabling it to escape the larger predators also preserved in the same rocks.* —R.Monastersky



Shubin& Jenkins/NATURE

Further evidence of a youthful universe

The conundrum continues.

Yet another set of observations indicates that the universe—as described by a popular cosmological model—appears to be younger than its oldest stars. The new study puts the age of the cosmos at 8.4 billion to 10.6 billion years, younger than the 13 billion to 16 billion years estimated for elderly stars.

Like the findings that made headlines a year ago, the new work relied on the Hubble Space Telescope to obtain the distance to a faraway cluster of galaxies. Combining that distance with the speed at which this cluster recedes from Earth, researchers determined the Hubble constant, which measures the expansion rate and age of the cosmos (SN: 10/8/94, p.232).

A team led by Nial R. Tanvir of the University of Cambridge in England used a two-step method to estimate the constant. First, they observed a type of "standard candle"—stars known as Cepheid variables—to find the distance to the spiral galaxy M96 in the Leo cluster of galaxies. Even at 37 million light-years, M96 lies too close to the Milky Way for its velocity to reflect cosmic expansion unadulterated by the gravitational tug of other galaxies. But the team used the Leo distance as a stepping-stone to the more remote Coma cluster.

To obtain the Coma distance, the researchers relied on a unique property of elliptical galaxies, they report in the Sept. 7 NATURE. Astronomers have long known that the bigger an elliptical galaxy, the greater its spread of stellar velocities. But the exact relationship between the two remained uncertain. Previous observations had hinted that the spiral galaxy M96 lies near the center of the Leo cluster, where the ellipticals gather. This coincidence enabled the team to use the distance to M96 to calibrate for the first time the relationship between the size of elliptical galaxies and their velocity spreads.

Applying this calibration to the elliptical galaxies in the Coma cluster, the team found a distance of about 345 million light-years and a Hubble constant between 61 and 77 kilometers per second per megaparsec (1 parsec is 3.26 light-years). In models in which the universe has just enough matter to keep from expanding forever, this corresponds to an age of about 9.5 billion years.

The discrepancy between this age and the age of old stars suggests that astronomers have come to a crossroads. They must either embrace a more complex cosmological model or reexamine how they estimate stellar ages. However, cautions theorist David N. Schramm of the University of Chicago, "You have to be very careful about [drawing conclusions] because all of the [Hubble constant] measurements have huge systematic errors." *—R. Cowen*