Tots Take Rhythmic Stock Before Talk

Scientists for the first time have evidence that, beginning as early as 2 months of age, babies intermittently babble approximately 3-second-long "prelinguistic phrases" characterized by a rhythm and structure that later underlie speech.

Both healthy infants and those with Down's syndrome, which usually includes severe language delays, vocalize in this way, assert Michael P. Lynch, a psychologist at Purdue University in West Lafayette, Ind., and his colleagues. However, for as yet unclear reasons, babies with Down's syndrome take considerably longer to finish prelinguistic phrases.

The new study is slated to appear in an upcoming DEVELOPMENTAL PSYCHOBIOLOGY. Other evidence gathered by Lynch's group, and accepted for publication in the AMERICAN JOURNAL OF MENTAL RETARDATION, indicates that babies with Down's syndrome utter their first speechlike syllables at an average age of 9 months, 2 months later than neurologically healthy infants. Previously, the earliest documented speech problems in Down's syndrome appeared at age 2.

These findings open the possibility of eventually using acoustic measures of the sounds babies make to identify those most likely to experience childhood speech and language problems, according to Lynch.

"The organization of prelinguistic phrases corresponds to the way in which adults use intonation and rhythm to segment a stream of speech," the Purdue scientist argues. "Babies may develop parsing mechanisms for vocalizing that later get modified for language use."

Lynch and his coworkers made monthly audio recordings of 16 infants from age 2 months to 1 year, eight of them healthy and eight with Down's syndrome. During each 20-minute session, babies played with a parent and an experimenter in a special acoustic chamber that held a number of quiet toys.

Acoustic data were gathered on infant utterances, defined as vocalizations bounded by an audible inhalation or at least 1 second of silence. Printouts showing selected sequences of utterances and types and numbers of syllables in each utterance were then given to seven adults with no training in coding infant vocalizations.

Adult judges showed a high level of agreement on which utterances "went together." An average of half the utterances — even at 2 to 4 months of age — fell within these groupings, which Lynch's team calls prelinguistic phrases.

Acoustic data indicated that phrase-ending syllables lasted longer than other syllables in a phrase. No such lengthening appeared for utterance-ending syllables. Moreover, babies spoke syllables more quickly within prelinguistic phrases than outside of them.

Down's babies displayed the same rhythmic complexity and organization in prelinguistic phrases as healthy infants, a sign of the phenomenon's strength, Lynch notes. But the former group took an average of more than 5 seconds to finish a prelinguistic phrase, compared to about 3 seconds for healthy infants.

Down's syndrome may create an extended time frame for communicating, Lynch proposes. As a result, prelinguistic phrases get extended and mothers and their babies with Down's syndrome more often vocalize simultaneously, an occurrence dubbed "vocal clashing."

More generally, prelinguistic phrases may make possible the give-and-take of vocal exchanges between caregivers and infants that helps to create an "intuitive bond" before babies can speak, Lynch asserts.

"The idea of prelinguistic phrases is likely to be true, although this study is only a nascent empirical glimpse at what human infants do," comments John L. Locke, head of the neurolinguistics laboratory at Massachusetts General Hospital in Boston.

Researchers have long noted that babies employ natural breaks in their babbling that sometimes give it the quality of actual talking, Locke says.

Acoustic measures of prelinguistic phrases should now be tested in other infants likely to develop speech disorders, such as those with autism, he adds.

Lynch's group next plans to examine how deaf babies vocalize. Prior studies show that these infants experience delays in babbling speechlike syllables.

— B. Bower

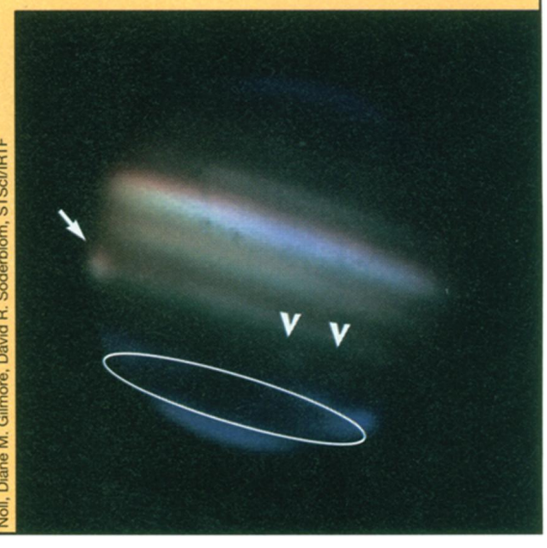
A comet's enduring impact on Jupiter

More than 7 weeks after Comet Shoemaker-Levy 9 pummeled Jupiter, the bruises remain. The dusty blemishes, which reside in the circled region in this false-color infrared picture, have smeared. But the image shows that the debris has stayed in clumps rather than uniformly girdling the planet.

Keith S. Noll and his colleagues at the Space Telescope Science Institute in Baltimore generated the picture by combining three images that Noll took Sept. 10 at the NASA Infrared Telescope Facility atop Hawaii's Mauna Kea. Each image depicts Jupiter at a slightly longer infrared wavelength and probes progressively higher regions of the atmosphere. Red (the lowest altitude) denotes a wavelength of 2.0 micrometers, green denotes 2.04 µm, and blue denotes 2.14 µm. The blue at the poles depicts normal haze.

The oval at left (arrow) is the Great Red Spot; the two ovals at right (carets) are smaller storm features. The blue hue of the debris suggests that it sits 20 to 100 kilometers above the visible cloud tops. Noll adds that these dust particles have diameters smaller than 1 µm; larger, heavier grains have already fallen to lower depths.

Reta F. Beebe of New Mexico State University in Las Cruces says that a visible-light image taken by the Hubble Space Telescope in late August also shows clumping. She notes that the dust hasn't spread as rapidly as might be expected because the wind in the upper atmosphere directly above the comet impact sites rotates at the same speed as the planet's core. Debris injected into the atmosphere away from the impact sites, where the wind speed differs from Jupiter's rotation, spreads east and west, she says. — R. Cowen



Noll, Diane M. Gilmore, David R. Soderblom, STScI/IRTF