

Babies have an instinct for grammar, study finds

Infants as young as 7 months can figure out rules for sentence structure, say researchers at New York University

By **ROBERT LEE HOTZ**

LA Times-Washington Post Service

Babies struggling to turn babble into polished patter use a previously undiscovered instinct for rules to master the building blocks of language, scientists at New York University announced Thursday.

The new insight is persuasive evidence that the ability to think in terms of formulas and rules is not only something that must be learned through schooling, as some scholars have argued, but is also a fundamental characteristic of every human mind, several language experts said.

"Babies are built to learn rules . . . with lightning speed," said psychologist Paul Bloom, an expert on language development at the University of Arizona.

Working with 7-month-old infants, the New York researchers determined that even the very young can make sense of speech by figuring out simple rules about the patterns of language structure and grammar. Moreover, the babies appear to deduce these formal rules well before they can understand what words mean or how to say them, at an age when the infant brain — which has twice as many neurons and is twice as energetic as an adult brain — is almost exploding with vitality.

"This is a universal property of the human mind," said NYU psychologist Gary Marcus, who led the research team. "Abstract rules form the core of everything from computer programs to grammars. Our results show that babies' minds are

built to look for such rules, even without being told."

The research, published today in *Science*, broadens the understanding of what might be built into every human brain at birth, from a rudimentary knowledge of shapes and numbers to a surprisingly well-stocked intellectual tool kit for learning what might be the most complex means of communication yet devised — human speech.

The work is certain to renew a fierce debate among linguists, psychologists and cognitive scientists about the nature of language and its place in the architecture of the human mind.

From earliest infancy, the new research suggests, the human mind is designed to handle symbols and variables, whether they are abstract numbers or words, in a manner reminiscent of a computer program.

Whether fundamental knowledge of language is hard-wired by evolution into the human brain in the form of a universal grammar, or acquired by every newborn from its parents and culture, is the stuff of scholarly brawls. Hard evidence of how language arises in the mind often is indirect at best.

To study how infants responded to language structure, Marcus and his colleagues conducted three experiments with 16 infants using an artificial language devised for the tests.

Each infant listened for two minutes to a series of three-word sentences that conformed to a uniform pattern. Then the infants listened to a series of different sentences, some following the original structure, others scrambled.

In their report, the researchers found that 90 percent of the infants were able to recognize the sentence structure they had heard before, based on their ability to quickly master the patterns of sentence com-

ponents — the essence of grammar.

The researchers took care to ensure that the children were not simply responding to familiar sounds or to pleasant sequences of syllables.

"Of course, babies of this age don't literally know nouns, verbs and adjectives," Marcus said. "But our results show that they understand the algebra of how to put words together into sentences."

Exploring the anatomy of language, experts have discovered that nature has forged remarkably intimate connections between parent and child that act to shape the structures of the developing brain. The new finding is the latest in a series of recent discoveries rooted in the biology of words.

No matter what language is spoken, for example, adults around the world croon to infants in a universal baby-talk. The singsong of this "parentese," with distorted tones, variable pitch and drawn-out vowels, teaches the phonetic building blocks of each baby's mother tongue, researchers at the University of Washington in Seattle recently determined.

Under the unconscious influence of such baby-talk, infants at 20 weeks of age already are attuned to the nuances of vowel sounds, and by the age of 6 months they are responding to sounds differently depending on their native language.

At the same time, the infant brain is so receptive to people around it that children as young as 6 months can learn new behaviors simply by observing other people for as little as 30 seconds, child psychologists at the University of Otago in New Zealand reported. And researchers at the University of Wisconsin in Madison recently discovered that infants can recognize how words begin and end by detecting statistical patterns in speech.