LINGUISTICS

From the Mouths (and Hands) of Babes

Nicaraguan deaf students have created a new sign language, and it has fueled the debate among linguists over how languages are formed

When Nicaragua established a school for the deaf in the late 1970s, teachers—all of them hearing—focused on teaching the children to read lips and to read and write Spanish. But outside the classroom, the children began to communicate by their own rules. Some teachers noticed the strange new hand gestures that the children exchanged and called it "mime," and a few adults found it useful to learn some of the gestures to communicate better with the children. But none, apparently, realized they were watching the birth of a language.

Not in the classroom. NSL arose from spontaneous conversation, not a lesson book.

Linguists discovered Nicaraguan Sign Language (NSL) in the mid-1980s, immediately recognizing it as a developing language and not a crude game of charades. They knew they'd struck research gold. "This is a unique case," says cognitive scientist Steven Pinker of the Massachusetts Institute of Technology (MIT). For the first time, he says, researchers have had the "ability to witness, in real time, how the structure of a language emerges as the language is being created."

No one taught the students to sign. Coming from hearing families and villages across the country, most possessed only a crude "home sign" system for expressing their needs to their families. But once a critical mass of children and teenagers came together, they created a still-growing vocabulary of signs and rules of grammar for stringing the signs together meaningfully. "This language was created on the school bus and in the play yard and in the street," says psycholinguist Ann Senghas of Barnard College in New York City.

The children, of course, had no idea that their rapidly coalescing system of gestures would feed into one of the fiercest debates in linguistics. Are children born with a so-called "language acquisition device," an innate capacity for syntax, that prepares them to build a language anew from the merest scraps of linguistic input, an idea most famously championed by Noam Chomsky of MIT? Or, as many others believe, do children simply possess general strategies for solving problems—and learning to communicate is one of the most immediate and urgent problems they face?

The debate can quickly turn ideological—"more religion than science," says psycholinguist Dan Slobin of the University of California, Berkeley, who falls in the general social strategies camp. But fueling the debate are a few special cases, such as the birth of NSL, in which linguists can try to tease apart the effects of the environment and innate abilities. In most cases, the data are rich and varied enough to lend themselves to a variety of interpretations—and NSL is no exception. Indeed, both camps are finding support for their views from this unique group of children.

Evolution of grammar

One of the early linguists on the scene in Nicaragua was Senghas, who eventually joined Pinker's lab as a grad student at MIT. Starting in the early 1990s, she tried to excavate the "fossil record of language emergence"—albeit a very fresh fossil record. By that time, new students had been arriving at the school for more than a decade, and the language had been growing more sophisticated and complex every year. Senghas wanted to find out who was behind this developing complexity—was it the very young children, the preteens, or the teenagers? If the youngest children were the architects of the language, that would lend credence to the argument that children come pre-equipped to invent language.

She focused on a form of grammar common to every known sign language but absent from spoken languages. Signers use locations in space to show how objects or ideas are related. For instance, making the sign for "cup" in a certain spot, followed by the sign for "tall" in that spot, makes it clear that the cup—and not necessarily the person drinking from it—is tall.

Signers don't always use this spatial grammatical construct, and they are able to get by without it—as in any spoken language, a listener can usually figure out an ambiguous sentence by context. From the start, linguists noted that NSL signers occasionally used space to convey meaning. But as NSL developed over the years, the roughly 400 students made more systematic use of space to clarify their intentions.

To quantify the use of spatial grammar and find out who uses it most, Senghas and Marie Coppola of the University of Rochester in New York showed a short cartoon to some NSL students and asked them to describe what they saw to other students. The researchers videotaped the interactions and simply counted how often and in what context the signers used spatial locations. They divided the students according to how old they were when they first came to the school—some arrived shortly after birth and others enrolled at age 19—and whether they entered the school in its earliest years or more recently. The researchers found that

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NSL signers who entered the community later (after 1983) were more likely to use space to link two concepts than were those who joined the school before 1983, the team reports in the July issue of *Psychological Science*. The prevalence of spatial grammar in people who entered the community recently—despite the fact that this group is younger, on average, and has been speaking the language for fewer years than the earlier cohort—indicates that the use of spatial grammar is a relatively recent phenomenon in the development of this language.

But the team's other finding has intrigued researchers even more. When they looked within the group of students who arrived at the school after 1983, they found that children who entered the school (and thus were exposed to the language) at the youngest ages—10 years or less—were the most likely to make use of this newly emerging grammatical construct. This suggests, Senghas says, that young children "are the creators of the language"—they're the ones pushing NSL to become more systematic and grammatical. The finding supports the notion that children have a "specific endowment for language," says psycholinguist Lila Gleitman of the University of Pennsylvania in Philadelphia.

Reinventing the wheel

Gleitman, for one, isn't surprised that young children seem to be creating NSL. In her assessment, all children, hearing or deaf, do much the same thing. "Every child in the course of so-called learning reinvents the notion of language," she says. That is, children hear more or less fragmentary speech in their environment, but they manage to deduce complex rules of grammar without being told these rules explicitly. And if they aren't exposed to a fully formed language, she says, they create one.

The birth of NSL, Gleitman claims, is a special case of a process that's been seen before: the transformation of a pidgin language into a creole. When people who speak a variety of native languages come together and have to communicate, they create a "contact language," or pidgin, which has some basic vocabulary and crude structure. One of the best-studied examples arose in Papua New Guinea on banana plantations where workers were brought in from many linguistically isolated islands.

The language of love is apparently translatable into pidgin: People in these communities mate and have children and speak pidgin in the home. But their children aren't satisfied with a stunted language. They elaborate on the pidgin, creating and systematizing rules of grammar and adding to the vocabulary until the language is sophisticated enough to be called a creole. The main linguistic powerhouses behind this creolization, claims Gleitman, are 5- to 8-year-olds, although she admits there's debate within the creolization field about the importance of children's contributions.

In NSL, the children started with even less linguistic input than those who grow up hearing pidgin. But even without hearing a language or seeing a language signed, Gleitman says, children "know what language is about. Everybody knows this from scratch."

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>
> —Ann Senghas

Rules of the game

But Slobin is not convinced that children are born knowing how to create a language. And he questions whether the youngest children are the sole innovators behind the emerging NSL language: "There's no evidence that [NSL] is being produced by children." Certainly, he says, the younger children are systematizing the language—making the rules more regular and establishing the community norms of how to communicate. But the basic grammatical constructs—including using space to show that two things are related—were already present even in the first group of students, he says, whatever their age when they arrived at the school. The children who arrived at younger ages are more fluent, just as people who learn a second language at a young age are more fluent than those who try to pick one up as adults, says Slobin. Those who learned NSL as young children are more likely to use space to designate meaning, he says, but they're refining and automating the language rather than inventing it from scratch.

Children often impose structure on a system, says Slobin. "Children in groups can agree on all sorts of rules," such as how to play a game. Similarly, in order to communicate efficiently, he says, children in the NSL community have to agree with each other about how to sign things. Slobin says this tendency to establish group norms is "more general than anything that happens in language."

In the middle

So are the young Nicaraguan children creating language from scratch, possibly by activating an innate language program? Or are young children just perfecting rules of a language established by children of all ages who are solving the social problem of how to communicate? "We're not taking a stand on that," says Coppola, who concedes that the data are not definitive. Even Gleitman admits that the evidence can be interpreted in a variety of ways. "If you know the literature," she says, "you can maintain positions all along the spectrum and not make an ass of yourself."

In the meantime, NSL continues to grow. The important studies now, Slobin says, will be of how the grammar develops over successive generations. The use of video techniques has made it possible to get a good record of the development of a sign language, something that was unavailable when American Sign Language was being systematized. And the origins of spoken languages such as English or French are "lost in the mists of prehistory," says MIT's Pinker. Even when more recent creoles developed, he says, "no one was there taking notes as it emerged."

—LAURA HELMUTH

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Language architects? Children younger than 10 might be creating Nicaraguan Sign Language.