

A Linguistic Big Bang

For the first time in history, scholars are witnessing the birth of a language — a complex sign system being created by deaf children in Nicaragua. By LAWRENCE OSBORNE

Photographs by SUSAN MEISELAS



At the Escuelita de Bluefields, 9-year-old Yuri Mejia signing the story of Babar: The young elephant is riding on his mother's back (left) when she is shot. He runs away (center) and then dissolves into tears (right).

When the Greek historian Herodotus was traveling in Egypt, he heard of a bizarre experiment conducted by a King named Psammetichus. The inquisitive monarch, wrote Herodotus, decided to wall up two baby boys in a secluded compound. Whatever came out of the boys' mouths, reasoned the King, would be the root language of our species — the key to all others. Herodotus tells us that eventually the children came up with the Phrygian word for bread, *bekos*. In addition to demonstrating the superiority of the Phrygian tongue, the King's inquiry proved that even if left to their own devices, children wouldn't be without language for long. We are born, Herodotus suggested, with the gift of gab.

Ever since, philosophers have dreamed of repeating Psammetichus's test. If children grew up isolated on a desert island, would they develop a bona fide language? And if so, would it resemble existing tongues? Yet only someone with the conscience of a Josef Mengele would carry out such an experiment. Then, in the mid-1980's, linguists were confronted with an unexpected windfall. Psammetichus's experiment was repeated, but this time it came about unintentionally. And not in Egypt but in Nicaragua.

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Following the 1979 Sandinista revolution, the newly installed Nicaraguan Government inaugurated the country's first large-scale effort to educate deaf children. Hundreds of students were enrolled in two Managua schools. Not being privy to the more than 200 existing sign languages used by hearing-impaired people around the world, Managua's deaf children started from ground

zero. They had no grammar or syntax — only crude gestural signs developed within their own families. These pantomimes, which deaf kids use to communicate basic needs like "eat," "drink" and "ice cream," are called *mimicas* in Spanish.

Most of the children arrived in Managua with only a limited repertory of *mimicas*. But once the students were placed together, they began to build on one another's signs. One child's gesture solidified into the community's word. The children's inexperienced teachers — who were having paltry success communicating with their profoundly deaf students — watched in awe as the kids began signing among themselves. A new language had begun to bloom.

A decade later, the children's creation has become a sensation of modern linguistics. Nicaraguan Sign Language (known to experts as I.S.N., for *Idioma de Signos Nicaragense*) has been patiently decoded by outside scholars, who describe an idiom filled with curiosities yet governed by the same "universal grammar" that the linguist Noam Chomsky claims structures all language. Steven Pinker, author of "The Language Instinct," sees what happened in Managua as proof that language acquisition is hard-wired inside the human brain. "The Nicaraguan case is absolutely unique in history," he maintains. "We've been able to see how it is that children — not adults — generate language, and we have been able to record it happening in great scientific detail. And it's the first and only time that we've actually seen a language being created out of thin air."

Managua's deaf children were stranded in school, not on a desert island. Spanish-speaking teachers were there to guide them. Yet it turns out that Nicaraguan Sign Language doesn't resemble Spanish at all. Indeed, the Managua teachers say they left hardly an imprint on the children's improvised language — largely because their lack of experience led them to adopt poor pedagogy. When the schools first opened, the Sandinista education officials were misguidedly urged by Soviet advisers to adopt "finger spelling," which uses simple signs to limn the alphabets of spoken languages. This approach was a disaster. Because the students had no prior concept of words (let alone letters), it proved fruitless to try to communicate in this fashion. The children remained linguistically disconnected from their teachers.

This failure to adopt a workable teaching strategy, paradoxically, gave the Nicaraguan children an opportunity to erect a linguistic structure of their own. Indeed, the frustrated Managua teachers began to notice that although the children could barely communicate with their instructors, they were beginning to communicate well among themselves, using a sign system that no teacher recognized. But what, exactly, was it?

In June 1986, the Nicaraguan Ministry of Education contacted Judy Kegl, an American sign-language expert at Northeastern University. They invited her to visit the deaf schools in Managua and see if she could shed some light on the enigma. Armed with notebooks and a Pentax camera — and a vague tenderness for the revolution — the 33-year-old Kegl set off for Managua.

Her first stop was Villa Libertad, a vocational school for deaf teenagers. Kegl, now a professor at the University of Southern Maine in Portland, set out to make a rudimentary dictionary of the signs being used by a small group of adolescent girls in a hairdressing workshop. Some signs were obvious enough: objects like "eyebrow tweezers" and "rolling curlers" were signed by more or less imitating the things themselves. But one day, a student playfully tested a more intricate sign on her. She first laid out her left palm flat; then, using her right hand, she traced a line from the middle finger to the base of the palm, turning her right hand over afterward and pointing below her belt. As a result of the girl's giggling, Kegl guessed that the sign meant "sanitary napkin." She had learned her first word in what seemed to be a simple form of communication.

After a few days, Kegl figured out the sign for "house" and could combine it with a typical Nicaraguan gesture for "What's up?" — a strong wrinkle of the nose — to ask the deaf students where they lived. The students' responses, however, were baffling. Each student would produce a series of complex but apparently meaningless hand wriggles. Only later would Kegl figure out that these wriggles were in fact precise descriptions of Managua's labyrinthine bus routes. Indeed, the grammar underlying this enigmatic sign system completely eluded her. "I felt like I was failing as a linguist," she recalls. "I couldn't find any consistent regularities. It seemed to be complete chaos."

Three weeks later, however, Kegl moved on to the primary school, known as San Judas, where younger children were being taught. On the first day, she observed a young girl named Mayela Rivas signing in a courtyard. Her gestures were rapid and had an eerie rhythmic consistency. Kegl sensed that Mayela was not just making crude mimicas or the kind of signed pidgin practiced by the older students at Villa Libertad.

"I looked at her, and I thought to myself, Holy cow, that girl is using some kind of rule book," she says. Ann Senghas, a former assistant of Kegl's who is now a professor at Barnard College, shares her wonder. "It was a linguist's dream," she says. "It was like being present at the Big Bang."

To crack the code used by the younger San Judas children, Kegl had them retell stories of Mr. Koumal, a popular Czech cartoon character. To relate the contents of a Koumal picture book, the children would need a variety of syntactic constructions and verb senses. In "Mr. Koumal Flies Like a Bird," for example, the adventurous Czech makes wings for himself by stealing chicken feathers. But after he crashes into a mountainside, Mr. Koumal uses the feathers to make Indian headdresses he can sell to children. By having the children reconstruct these stories in their own tongue, telltale regularities emerged that, bit by bit, provided Kegl with clues to the language's grammar.

It was noticeable at once that the younger children used signs in a more nuanced way than the older students. For

example, the teen-age pidgin signers at Villa Libertad had a basic gesture for "speak" — *opening* and *closing* four fingers and a thumb in front of the mouth. The younger children used the same sign, but modulated it, opening their fingers at the position of the speaker and closing them at the position of the addressee. To Kegl, this apparently small difference



Anselmo Aleman, now 20, didn't come to Bluefields until he was 15, a relatively late start. "I was like Babar in the big city going in the elevator for the first time," he says.

had enormous implications. "This was verb agreement," she says, "and they were all using it fluently." Similarly, in retelling the Koumal story, the younger kids could express what linguists call "spatial agreement" with their verbs. When they used the verb "to fall" — as in "Mr. Koumal falls down the mountain" — they made a link between Mr. Koumal's falling and what he was falling down. These nuanced signers would first lift one hand in the air to signify "mountaintop" and then begin the sign for "fall" from this height, flipping the hand back and forth while moving it down an imaginary slope.

What explained this difference between the younger and older signers? Kegl's theory, which has been disseminated in various linguistic journals, is that an original group of home signers came up with an elemental pidgin among themselves, known to linguists as *Lenguaje de Signos Nicaragense*. This was the comparatively crude signing she had observed among the older students. Then, very young children of 5 or 6 had come into the school system. Quickly mastering the pidgin from their elder peers, they had then taken it, quite unconsciously, to a far higher level. This second version was the fast, elegantly orchestrated language that Kegl had seen flying from the little fingers of Mayela Rivas. This was what would become known as the *idioma*, or Nicaraguan Sign Language. These three quite distinct levels — home signs, the *lenguaje* and the *idioma* — represent phases of evolution, from pantomime to pidgin to language. "Real language in this case," she says, "only emerged with young children first exposed to a signed pidgin."

But how did Nicaraguan Sign Language evolve in the first place? Kegl likens the process to a field of stones waiting to be made into a fence. The "stones" in this case came from the gesture system that speaking Nicaraguans use in daily life. Hence, the first deaf signs for "eat" and "drink" were close to those used by hearing speakers: a flat hand with the fingers bending back and forth before the mouth for "eat"; a thumb gesturing toward the mouth for "drink."

"What happens," Kegl explains, "is that these gestures become gradually richer and more varied. But we can't see the leap between them and the first signs of language because the grammar is inside the child. It manifests itself only as the child is exposed to this ever-richer mix of odds and ends." This ability to organize a heap of stones into a fence lies within the brain itself, and is apparently stimulated by interaction with other children.

"We see these children coming to some kind of unconscious consensus about which signs to use and which ones to drop," she continues. "But we can't explain it fully; we can just witness the outcome. There's an element of mystery in the way in which each child adapts to and then changes the language." The very youngest children, Kegl theorizes, filter the linguistic jumble around them differently and then transmit their inventions, deformations and additions back to the larger group. In this way, new words enter the lexicon. "Yet there's no dominant alpha speaker who leads the way," she adds. "Each child gives birth to a kind of individual dialect, which is then pooled among the others according to a process that we don't fully understand."

'I can remember my childhood,' Aleman signs, 'but I can also remember not having any way to communicate.' His palm wipes his forehead, suggesting someone erasing a blackboard.

After more than a decade of study, Kegl and Ann Senghas have mapped out an idiom striking in its flexibility. Verbs, for example, can be stretched like a rubber band to include all kinds of nouns and prepositions. In the story "Mr. Koumal Flies Like a Bird," children line up to give the wily Czech an egg each in exchange for one of his Indian headdresses. This action is expressed by a single verb sign in which the hand turns up in an egg shape, bounces twice away from the body and then turns sharply upward. This one sign would be literally translated in English as "each person in a row of individuals gives an egg-shaped object to an adult." Even more oddly, prepositions in Nicaraguan Sign

Language function much like verbs. Hence, where an English speaker would say, "The cup is on the table," a Nicaraguan signer will sign something like, "Table cup ons." Verbs and prepositions are therefore protean in a way that resembles only a few spoken languages, like Navajo.

With all of these idiosyncrasies, it is easy to forget that Nicaraguan Sign Language is but the accidental creation of children. Indeed, adult-engineered idioms like Esperanto seem pallid by comparison. As Kegl marvels, "No linguist could create a language with half the complexity or richness that a 4-year-old could give birth to."

Little Yuri Mejia is 9 years old and has been deaf from birth. Under the mango trees of the Parque Reyes in Bluefields, a remote port city on Nicaragua's Mosquito Coast, she peers down into an ornamental pool filled with tiny baby alligators. She is neatly dressed in her pressed navy skirt and symmetrical pigtails. With facial expressions and hand gestures working simultaneously, she turns out crisp, twinkling sentences at lightning speed. Her face slips and slides, moving from clownlike frowns to delicate nose wrinkles. Yuri is one of the youngest pupils at the Escuelita de Bluefields, an experimental school that Judy Kegl and her husband, James Shepard-Kegl, have been running since 1995.

Because she was educated so early, Yuri signs with a fluent grace. "When are the alligators going to wake up?" she signs to me through

James Shepard-Kegl, who has agreed to act as my translator. "Every time I come to the park they're asleep."

With Shepard-Kegl's help, I ask her if she likes school.

"At home," she signs back quickly, "I'm bored. I live with my grandmother. It's way over there in the barrio. We sit around, and we're bored all the time. We do a lot of laundry. But at school, everyone's deaf, so I can talk to them. And I can read a book about Babar."

Bursting with curiosity, she then asks me where I live. The one Nicaraguan sign I have mastered on my second day in Bluefields is the one for New York. You put your forefinger against your forehead three times to imitate the tiara spikes of Lady Liberty and then raise your arm in a fist.

"Do you live with your grandmother, too?" Yuri asks.

"No."

"Do you know who Babar is?"

"Yes, of course."

"His mommy was killed in the forest, and he came to the town and went up an elevator." She nods wisely. "Babar went up and down in the elevator," she signs.

To make the sign for Babar, Yuri holds up four fingers (the sign for "B"), touches her nose with her thumb and quickly dips the hand down to describe an elephant's trunk. To convey the elevator's movement, she forms a platform with her left hand upon which she plants two fingers of her right hand in an inverted V: a person standing on an elevator floor. She then moves the "elevator" up and down.

Yuri and I head to the school's dormitory on the waterfront. The pink house sits on a winding alley of cracked paving stones from which the moody Bluefields lagoon can be seen. Inside, 15 students between the ages of 10 and 25 relax on homemade bunk beds, entertained by a television set with the sound turned off. There, I meet the Bluefields family one by one. The students range from Daphney, a freckled 15-year-old who recently broke her leg turning cartwheels, to 11-year-old Barney, a vivacious boy with shells twisted into his hair who began signing the language as a baby.

Immediately curious about the newcomer, they cast about for a name sign for me. Sign-language names are not phonetic but visual. One boy raised his hand to signify height. (I am 6 foot 5, gigantic by Nicaraguan standards.) Another offered a personalized twist on the sign for "journalist": a miming of a microphone passing from mouth to mouth. Finally, however, by dinnertime the matter was settled otherwise. One girl put a finger vertically against her chin, and amid a burst of laughter, I was christened "Dimple."

Many of these whimsical name signs are perceptive. The one for Daniel Ortega, Nicaragua's former Sandinista President, for example, is one hand tapping the opposing wrist to signify Ortega's flashy Rolex watch, a loud symbol for a poor deaf child. Fidel Castro is a wagging, sermonizing finger combined with a V-sign near the mouth to suggest smoking a cigar. Signs for many nouns are similarly expressive: a wriggling hand for "fish" or fingers shooting like pistols for "Texas." Verbs, by contrast, can seem elegantly esoteric. To say "to look for," the left hand is first held flat with the palm facing downward; then the pinkie, index finger and thumb of the right hand are extended while the two remaining fingers brush the back of the left hand repeatedly.

The Bluefields schoolhouse is a simple, one-room building with maize-yellow walls. The curriculum varies from elementary word recognition for the tots to mathematics and geography for the older signers. In addition, the students are working to translate Nicaraguan Sign Language onto the written page. (They use a Danish symbolic system for transcribing signs into a written phonemic code: there is a symbol for wrinkling one's nose, for example, and another for clenching one's right fist.) One of the first books to be translated is "The Story of Babar," explaining why the innocent elephant has become a constant reference point for the children. The school's dictionary now totals 1,600 words, and the children have begun preparing a heavily truncated version of "Moby-Dick." One thing that is not taught at Bluefields, however, is a more established sign system like American Sign Language. In order to preserve what Nicaragua's deaf have created, Kegl does not want to encourage the adoption of other idioms — even if that leaves the students unable to communicate with other deaf communities. "We don't want to kill indigenous language," she says.

Toward the end of my first day in school, the class is interrupted by a troupe of clowns who for some reason have decided to test their act on the deaf children. The students head outside to the garden to watch. The clowns then put on a show of Fellini-esque ineptitude, dropping their bowling pins and failing to turn their somersaults. Finally one of them gets it right, and I decide it is time for applause. I begin clapping furiously. There is utter silence. A little put out, I turn to see the entire class raising their hands above their heads and wiggling their fingers with deadpan expressions.

Impressed by this silent form of applause, I decide that from now on I will do the same, and so I raise my hands, wriggling my fingers. The class laughs and all simultaneously put their fingers to their chins. Dimple is catching on.

The sign languages of deaf children have been of central interest to linguists for a quarter century. Underlying this interest is a quest to find a linguistic "bioprogram": that is, an innate human ability to generate all the fundamental characteristics of language, from word creation to grammar — without the help of auditory or vocal cues.

In 1978, Heidi Feldman,
Susan Goldin-Meadow and

Lila Gleitman published a seminal paper on the linguistic propensities of deaf children, based on a group of Philadelphia kids who used simple home signs to communicate with their hearing parents. The researchers found that a deaf child making crude home signs would, in time, begin bending them into languagelike patterns without knowing what he was doing



Like kids everywhere, the ones at Bluefields know how to yuk it up. Here, they give the photographer a round of silent applause by wiggling their fingers.

and without being taught. The mothers of these home signers, the scholars revealed, knew far fewer signs than the children themselves. (As trained linguists, they were able to determine the full extent of the children's vocabularies.) And while the parents used the home signs erratically, the deaf children deployed their home signs in a more consistent order.

"Even deaf children grammaticize, regularize — yet they can't have learned it anywhere," Lila Gleitman says. She sees the Nicaraguan case as buttressing her own work. "In Managua, the children formed a continuing community that allowed their nascent language to grow in grammatical and semantic structure. It's a magnificent example of a whole language emerging with incredible richness."

Yet for all its triumphs, the scholarship on Nicaraguan Sign Language makes clear that a precise line between nature and nurture is difficult to establish. Language is the product of a shadowy collusion between biological predisposition and social stimuli. The bioprogram, in other words, is triggered into action by a language community. "It would be hard to find language acquisition in a vacuum," says Gleitman.

Jill Morford, a linguist at the University of New Mexico in Albuquerque, argues that home signers are stuck in a limbo between gesture and language. "Home signing," she says, "is cognitively similar to language, but it doesn't have a grammar as such. It's in between. The beauty of the Nicaraguan children is that they show dramatically how we need both sides of the coin, the social and the innate working together."

To see the limitations of home signing for myself, I take a trip with James Shepard-Kegl by motorboat to the Pearl Lagoon, one hour north of Bluefields. There, a few deaf children still live in almost total isolation deep in the forests. If Bluefields seems remote, then the Pearl Lagoon resembles another planet. Dreamy estuaries snake through bromeliad-sprinkled rain forest that is almost empty except for a handful of farmers living in tiny settlements connected only by river.

Many of the children's signs

In a hamlet called Haulover, where huts are ringed with paths of oyster shells, I meet a 10-year-old deaf boy named Winston. He

are perceptive. The one for Daniel Ortega, Nicaragua's former President, is one hand tapping the opposing wrist — to signify Ortega's flashy Rolex watch.

has never been to school. A kind of Pearl Lagoon Huck Finn, he's about as isolated a home signer as you could possibly hope to find anywhere. He spends all his days fishing with his homemade lines and has a small if appropriate repertory of fishing signs. Excited to have visitors from the big city of Bluefields, he shows us some pigeons he shot with his sling. As we sit in rocking chairs on the porch, his mother tells us that she and Winston can "talk just fine." Winston goes into long bouts of head-rocking laughter and shows us his limited stock of signs. It is clear that he

communicates with his family on some level, but there is no rhythm, no fluidity, to his speech.

"Did you catch fish?" I ask. His mother translates.

"Catch," he signs back.

"How?"

He makes a whacking gesture.

Winston cannot express things like "today" or "later," and he rarely if ever puts three signs together to make something that one could call a sentence. Whereas Bluefields children somersault through complex sentences, Winston lumbers along slowly, one sign at a time.

As he walks Shepard-Kegl and me back to the jetties of Pearl Lagoon, Winston shows me a few signs. "Tree." "River." "House." His hand motions are slow, and there is a curious monotony in his expression that somehow belies his exuberance.

I take his picture, and he shows me his fishing line and his knife. "Big," he adds. "Tasty. Catch. Eat."

"It's sad," says Shepard-Kegl as we walk away. "But Winston's family doesn't want him to come to the school, and so he'll remain at this level all his life. He'll never develop a real language."

In the terrace of the Tia Irene, a waterfront hotel in Bluefields, I sit with 20-year-old Anselmo Aleman playing chess while rain pounds on the thatched roof. The lagoon is shadowed; the rusted fishing boats rock violently in the downpour. We are eating a plate of pale purple star apples. The slender Aleman is a charming chess companion, apart from being impossible to beat. Like Winston, he grew up in the deep rain forest, but unlike him, Aleman came to Bluefields.

Suddenly moving his bishop into check-mate position, he smiles. "It's like war," he signs. "You must concentrate or you lose."

Aleman learned Nicaraguan Sign Language at 15, a relatively late age. Intelligence and hard work, however, have enabled him to

master the idiom with almost total fluency. "I couldn't learn the language earlier," he signs, "because I grew up in the forest. It was during the war, too, and since my father was a contra, we were always hiding, being hunted down by Sandinistas. So I remember guns, fear, hiding. When I came to Bluefields I was amazed. I was like" — he pauses for a moment — Babar in the big city going in the elevator for the first time."

Aleman tells me a long, complicated story about his being hit by a firetruck when he was little, sprinkling his account with small scenes and characters. "I can remember my childhood," he signs, "but I can also remember not having any way to communicate. Then, my mind was just a blank." He makes a poignant sign for this emptiness, the palm wiping his forehead to suggest someone erasing a blackboard.

But Aleman will never return to the blank slate. He stands at the center of a young, dynamically evolving language that is now devolving into dialects and variations. Like all living languages, Nicaraguan Sign Language is plastic, mercenary and gleefully derivative — picking up idioms, slang and even basic nouns wherever it fancies. There is even a "street" dialect that diverges in sometimes salacious ways from the official version sanctioned by the Nicaraguan National Association of the Deaf.

The precise intellectual import of Nicaraguan Sign Language is still being hammered out by linguists. Noam Chomsky, who calls what has happened in Nicaragua "a remarkable natural experiment," has for decades propounded the theory that there is a "biology of grammar" embedded in our brains. (It is no accident, he has argued, that every language from English to Zulu has subjects and verbs.) But he is wary of saying that Kegl's research settles the issue. "These children may have shown us something remarkable, if indeed they came up with this language with little or no input from outside," he says. "If that's the case, it's a very intriguing situation indeed."

But the meditations of world-famous linguists do not mean much to Aleman as we stroll down to the Parque Reyes. As we sit under the coconut palms amid rusting pieces of farm machinery, decorative rubber tires and a dilapidated bust of the Nicaraguan poet Ruben Dario, the park seems to be at the end of the world. Seeing us signing together, a group of Miskito Indian women stare at us in amazement and are soon joined by the local sorbet vendor.

"I can't imagine," Aleman signs, genuinely mystified, "why you came all this way to hear us talk. It's just our language. What's the big deal?"

I tell him that many people are curious to know how a few deaf children invented the world's youngest language.

"I never thought of it that way," he signs.

"It's a pretty language, too," I try to sign back. I hold both palms toward my chest, moving my hands up and down to signify "sign

language." Then I join the index finger and thumb of my right hand to make an oval — almost like the American sign for "O.K." — and glide it away from my chest to say "pretty."

"Is it?" Aleman replies. Then he beams with an undisguised pleasure. "Yes," he says, "I suppose it is."

[Table of Contents](#)

October 24, 1999

[Home](#) | [Site Index](#) | [Site Search](#) | [Forums](#) | [Archives](#) | [Marketplace](#)

[Quick News](#) | [Page One Plus](#) | [International](#) | [National/N.Y.](#) | [Business](#) | [Technology](#) | [Science](#) | [Sports](#) | [Weather](#) | [Editorial](#) | [Op-Ed](#) | [Arts](#) | [Automobiles](#) | [Books](#) | [Diversions](#) | [Job Market](#) | [Real Estate](#) | [Travel](#)

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