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An Instinct to Acquire an Art

As you are reading these words, you are taking part in one of the wonders of the natural world. For you and I belong to a species with a remarkable ability: we can shape events in each other's brains with exquisite precision. I am not referring to telepathy or mind control or the other obsessions of fringe science; even in the depictions of believers these are blunt instruments compared to an ability that is uncontroversially present in every one of us. That ability is language. Simply by making noises with our mouths, we can reliably cause precise new combinations of ideas to arise in each other's minds. The ability comes so naturally that we are apt to forget what a miracle it is. So let me remind you with some simple demonstrations. Asking you only to surrender your imagination to my words for a few moments, I can cause you to think some very specific thoughts:

When a male octopus spots a female, his normally grayish body suddenly becomes striped. He swims above the female and begins caressing her with seven of his arms. If she allows this, he will quickly reach toward her and slip his eighth arm into her breathing tube. A series of sperm packets moves slowly through a groove in his arm, finally to slip into the mantle cavity of the female.

Cherries jubilee on a white suit? Wine on an altar cloth? Apply club soda immediately. It works beautifully to remove the stains from fabrics.

When Dixie opens the door to Tad, she is stunned, because she thought he was dead. She slams it in his face and then tries to escape. However, when Tad says, "I love you," she lets him in. Tad comforts her, and they become passionate. When Brian interrupts, Dixie tells a stunned Tad that she and Brian were married earlier that day. With much difficulty, Dixie informs Brian that things are nowhere near finished between her and Tad. Then she spills the news that Jamie is Tad's son. "My what?" says a shocked Tad.

Think about what these words have done. I did not simply remind you of octopuses; in the unlikely event that you ever see one develop stripes, you now know what will happen next. Perhaps the next time you are in a supermarket you will look for club soda, one out of the tens of thousands of items available, and then not touch it until months later when a particular substance and a particular object accidentally come together. You now share with millions of other people the secrets of protagonists in a world that is the product of some stranger's imagination, the daytime drama *All My Children*. True, my demonstrations depended on our ability to read and write, and this makes our communication even more impressive by bridging gaps of time, space, and acquaintanceship. But writing is clearly an optional accessory; the real engine of verbal communication is the spoken language we acquire as children.

In any natural history of the human species, language would stand out as the preeminent trait. To be sure, a solitary human is an impressive problem-solver and engineer. But a race of Robinson Crusoes would not give an extraterrestrial observer all that much to remark on. What is truly arresting about our kind is better captured in the story of the Tower of Babel, in which humanity, speaking a single language, came so close to reaching heaven that God himself felt threatened. A common language connects the members of a com-

munity into an information-sharing network with formidable collective powers. Anyone can benefit from the strokes of genius, lucky accidents, and trial-and-error wisdom accumulated by anyone else, present or past. And people can work in teams, their efforts coordinated by negotiated agreements. As a result, *Homo sapiens* is a species, like blue-green algae and earthworms, that has wrought far-reaching changes on the planet. Archeologists have discovered the bones of ten thousand wild horses at the bottom of a cliff in France, the remains of herds stampeded over the clifftop by groups of paleolithic hunters seventeen thousand years ago. These fossils of ancient cooperation and shared ingenuity may shed light on why saber-tooth tigers, mastodons, giant woolly rhinoceroses, and dozens of other large mammals went extinct around the time that modern humans arrived in their habitats. Our ancestors, apparently, killed them off.

Language is so tightly woven into human experience that it is scarcely possible to imagine life without it. Chances are that if you find two or more people together anywhere on earth, they will soon be exchanging words. When there is no one to talk with, people talk to themselves, to their dogs, even to their plants. In our social relations, the race is not to the swift but to the verbal—the spellbinding orator, the silver-tongued seducer, the persuasive child who wins the battle of wills against a brawnier parent. Aphasia, the loss of language following brain injury, is devastating, and in severe cases family members may feel that the whole person is lost forever.

This book is about human language. Unlike most books with "language" in the title, it will not chide you about proper usage, trace the origins of idioms and slang, or divert you with palindromes, anagrams, eponyms, or those precious names for groups of animals like "exaltation of larks." For I will be writing not about the English language or any other language, but about something much more basic: the instinct to learn, speak, and understand language. For the first time in history, there is something to write about it. Some thirty-five years ago a new science was born. Now called "cognitive science," it combines tools from psychology, computer science, linguistics, philosophy, and neurobiology to explain the workings of human intelli-

gence. The science of language, in particular, has seen spectacular advances in the years since. There are many phenomena of language that we are coming to understand nearly as well as we understand how a camera works or what the spleen is for. I hope to communicate these exciting discoveries, some of them as elegant as anything in modern science, but I have another agenda as well.

The recent illumination of linguistic abilities has revolutionary implications for our understanding of language and its role in human affairs, and for our view of humanity itself. Most educated people already have opinions about language. They know that it is man's most important cultural invention, the quintessential example of his capacity to use symbols, and a biologically unprecedented event irrevocably separating him from other animals. They know that language pervades thought, with different languages causing their speakers to construe reality in different ways. They know that children learn to talk from role models and caregivers. They know that grammatical sophistication used to be nurtured in the schools, but sagging educational standards and the debasements of popular culture have led to a frightening decline in the ability of the average person to construct a grammatical sentence. They also know that English is a zany, logic-defying tongue, in which one drives on a parkway and parks in a driveway, plays at a recital and recites at a play. They know that English spelling takes such wackiness to even greater heights—George Bernard Shaw complained that *fish* could just as sensibly be spelled *ghoti* (*gh* as in *tough*, *o* as in *women*, *ti* as in *nation*)—and that only institutional inertia prevents the adoption of a more rational, spell-it-like-it-sounds system.

In the pages that follow, I will try to convince you that every one of these common opinions is wrong! And they are all wrong for a single reason. Language is not a cultural artifact that we learn the way we learn to tell time or how the federal government works. Instead, it is a distinct piece of the biological makeup of our brains. Language is a complex, specialized skill, which develops in the child spontaneously, without conscious effort or formal instruction, is deployed without awareness of its underlying logic, is qualitatively the same in every

individual, and is distinct from more general abilities to process information or behave intelligently. For these reasons some cognitive scientists have described language as a psychological faculty, a mental organ, a neural system, and a computational module. But I prefer the admittedly quaint term “instinct.” It conveys the idea that people know how to talk in more or less the sense that spiders know how to spin webs. Web-spinning was not invented by some unsung spider genius and does not depend on having had the right education or on having an aptitude for architecture or the construction trades. Rather, spiders spin spider webs because they have spider brains, which give them the urge to spin and the competence to succeed. Although there are differences between webs and words, I will encourage you to see language in this way, for it helps to make sense of the phenomena we will explore.

Thinking of language as an instinct inverts the popular wisdom, especially as it has been passed down in the canon of the humanities and social sciences. Language is no more a cultural invention than is upright posture. It is not a manifestation of a general capacity to use symbols: a three-year-old, we shall see, is a grammatical genius, but is quite incompetent at the visual arts, religious iconography, traffic signs, and the other staples of the semiotics curriculum. Though language is a magnificent ability unique to *Homo sapiens* among living species, it does not call for sequestering the study of humans from the domain of biology, for a magnificent ability unique to a particular living species is far from unique in the animal kingdom. Some kinds of bats home in on flying insects using Doppler sonar. Some kinds of migratory birds navigate thousands of miles by calibrating the positions of the constellations against the time of day and year. In nature's talent show we are simply a species of primate with our own act, a knack for communicating information about who did what to whom by modulating the sounds we make when we exhale.

Once you begin to look at language not as the ineffable essence of human uniqueness but as a biological adaptation to communicate information, it is no longer as tempting to see language as an insidious shaper of thought, and, we shall see, it is not. Moreover, seeing lan-

guage as one of nature's engineering marvels—an organ with “that perfection of structure and co-adaptation which justly excites our admiration,” in Darwin's words—gives us a new respect for your ordinary Joe and the much-maligned English language (or any language). The complexity of language, from the scientist's point of view, is part of our biological birthright; it is not something that parents teach their children or something that must be elaborated in school—as Oscar Wilde said, “Education is an admirable thing, but it is well to remember from time to time that nothing that is worth knowing can be taught.” A preschooler's tacit knowledge of grammar is more sophisticated than the thickest style manual or the most state-of-the-art computer language system, and the same applies to all healthy human beings, even the notorious syntax-fracturing professional athlete and the, you know, like, inarticulate teenage skateboarder. Finally, since language is the product of a well-engineered biological instinct, we shall see that it is not the nutty barrel of monkeys that entertainer-columnists make it out to be. I will try to restore some dignity to the English vernacular, and will even have some nice things to say about its spelling system.

The conception of language as a kind of instinct was first articulated in 1871 by Darwin himself. In *The Descent of Man* he had to contend with language because its confinement to humans seemed to present a challenge to his theory. As in all matters, his observations are uncannily modern:

As . . . one of the founders of the noble science of philology observes, language is an art, like brewing or baking; but writing would have been a better simile. It certainly is not a true instinct, for every language has to be learned. It differs, however, widely from all ordinary arts, for man has an instinctive tendency to speak, as we see in the babble of our young children; while no child has an instinctive tendency to brew, bake, or write. Moreover, no philologist now supposes that any language has been deliberately invented; it has been slowly and unconsciously developed by many steps.

Darwin concluded that language ability is “an instinctive tendency to acquire an art,” a design that is not peculiar to humans but seen in other species such as song-learning birds.

A language instinct may seem jarring to those who think of language as the zenith of the human intellect and who think of instincts as brute impulses that compel furry or feathered zombies to build a dam or up and fly south. But one of Darwin's followers, William James, noted that an instinct possessor need not act as a “fatal automaton.” He argued that we have all the instincts that animals do, and many more besides; our flexible intelligence comes from the interplay of many instincts competing. Indeed, the instinctive nature of human thought is just what makes it so hard for us to see that it is an instinct:

It takes . . . a mind debauched by learning to carry the process of making the natural seem strange, so far as to ask for the *why* of any instinctive human act. To the metaphysician alone can such questions occur as: Why do we smile, when pleased, and not scowl? Why are we unable to talk to a crowd as we talk to a single friend? Why does a particular maiden turn our wits so upside-down? The common man can only say, “*Of course* we smile, *of course* our heart palpitates at the sight of the crowd, *of course* we love the maiden, that beautiful soul clad in that perfect form, so palpably and flagrantly made for all eternity to be loved!”

And so, probably, does each animal feel about the particular things it tends to do in presence of particular objects. . . . To the lion it is the lioness which is made to be loved; to the bear, the she-bear. To the broody hen the notion would probably seem monstrous that there should be a creature in the world to whom a nestful of eggs was not the utterly fascinating and precious and never-to-be-too-much-sat-upon object which it is to her.

Thus we may be sure that, however mysterious some animals' instincts may appear to us, our instincts will appear no less mysterious to them. And we may conclude that, to the

animal which obeys it, every impulse and every step of every instinct shines with its own sufficient light, and seems at the moment the only eternally right and proper thing to do. What voluptuous thrill may not shake a fly, when she at last discovers the one particular leaf, or carrion, or bit of dung, that out of all the world can stimulate her ovipositor to its discharge? Does not the discharge then seem to her the only fitting thing? And need she care or know anything about the future maggot and its food?

I can think of no better statement of my main goal. The workings of language are as far from our awareness as the rationale for egg-laying is from the fly's. Our thoughts come out of our mouths so effortlessly that they often embarrass us, having eluded our mental censors. When we are comprehending sentences, the stream of words is transparent; we see through to the meaning so automatically that we can forget that a movie is in a foreign language and subtitled. We think children pick up their mother tongue by imitating their mothers, but when a child says *Don't giggle me!* or *We holded the baby rabbits*, it cannot be an act of imitation. I want to debauch your mind with learning, to make these natural gifts seem strange, to get you to ask the "why" and "how" of these seemingly homely abilities. Watch an immigrant struggling with a second language or a stroke patient with a first one, or deconstruct a snatch of baby talk, or try to program a computer to understand English, and ordinary speech begins to look different. The effortlessness, the transparency, the automaticity are illusions, masking a system of great richness and beauty.

In this century, the most famous argument that language is like an instinct comes from Noam Chomsky, the linguist who first unmasked the intricacy of the system and perhaps the person most responsible for the modern revolution in language and cognitive science. In the 1950s the social sciences were dominated by behaviorism, the school of thought popularized by John Watson and B. F. Skinner. Mental terms like "know" and "think" were branded as unscientific; "mind" and "innate" were dirty words. Behavior was explained by a

few laws of stimulus-response learning that could be studied with rats pressing bars and dogs salivating to tones. But Chomsky called attention to two fundamental facts about language. First, virtually every sentence that a person utters or understands is a brand-new combination of words, appearing for the first time in the history of the universe. Therefore a language cannot be a repertoire of responses; the brain must contain a recipe or program that can build an unlimited set of sentences out of a finite list of words. That program may be called a mental grammar (not to be confused with pedagogical or stylistic "grammars," which are just guides to the etiquette of written prose). The second fundamental fact is that children develop these complex grammars rapidly and without formal instruction and grow up to give consistent interpretations to novel sentence constructions that they have never before encountered. Therefore, he argued, children must innately be equipped with a plan common to the grammars of all languages, a Universal Grammar, that tells them how to distill the syntactic patterns out of the speech of their parents. Chomsky put it as follows:

It is a curious fact about the intellectual history of the past few centuries that physical and mental development have been approached in quite different ways. No one would take seriously the proposal that the human organism learns through experience to have arms rather than wings, or that the basic structure of particular organs results from accidental experience. Rather, it is taken for granted that the physical structure of the organism is genetically determined, though of course variation along such dimensions as size, rate of development, and so forth will depend in part on external factors. . . .

The development of personality, behavior patterns, and cognitive structures in higher organisms has often been approached in a very different way. It is generally assumed that in these domains, social environment is the dominant factor. The structures of mind that develop over time are taken to be arbitrary and accidental; there is no "human nature" apart from what develops as a specific historical product. . . .

But human cognitive systems, when seriously investigated, prove to be no less marvelous and intricate than the physical structures that develop in the life of the organism. Why, then, should we not study the acquisition of a cognitive structure such as language more or less as we study some complex bodily organ?

At first glance, the proposal may seem absurd, if only because of the great variety of human languages. But a closer consideration dispels these doubts. Even knowing very little of substance about linguistic universals, we can be quite sure that the possible variety of language is sharply limited. . . . The language each person acquires is a rich and complex construction hopelessly underdetermined by the fragmentary evidence available [to the child]. Nevertheless individuals in a speech community have developed essentially the same language. This fact can be explained only on the assumption that these individuals employ highly restrictive principles that guide the construction of grammar.

By performing painstaking technical analyses of the sentences ordinary people accept as part of their mother tongue, Chomsky and other linguists developed theories of the mental grammars underlying people's knowledge of particular languages and of the Universal Grammar underlying the particular grammars. Early on, Chomsky's work encouraged other scientists, among them Eric Lenneberg, George Miller, Roger Brown, Morris Halle, and Alvin Liberman, to open up whole new areas of language study, from child development and speech perception to neurology and genetics. By now, the community of scientists studying the questions he raised numbers in the thousands. Chomsky is currently among the ten most-cited writers in all of the humanities (beating out Hegel and Cicero and trailing only Marx, Lenin, Shakespeare, the Bible, Aristotle, Plato, and Freud) and the only living member of the top ten.

What those citations *say* is another matter. Chomsky gets people exercised. Reactions range from the awe-struck deference ordinarily

reserved for gurus of weird religious cults to the withering invective that academics have developed into a high art. In part this is because Chomsky attacks what is still one of the foundations of twentieth-century intellectual life—the “Standard Social Science Model,” according to which the human psyche is molded by the surrounding culture. But it is also because no thinker can afford to ignore him. As one of his severest critics, the philosopher Hilary Putnam, acknowledges,

When one reads Chomsky, one is struck by a sense of great intellectual power; one knows one is encountering an extraordinary mind. And this is as much a matter of the spell of his powerful personality as it is of his obvious intellectual virtues: originality, scorn for the faddish and the superficial; willingness to revive (and the ability to revive) positions (such as the “doctrine of innate ideas”) that had seemed *passé*; concern with topics, such as the structure of the human mind, that are of central and perennial importance.

The story I will tell in this book has, of course, been deeply influenced by Chomsky. But it is not his story exactly, and I will not tell it as he would. Chomsky has puzzled many readers with his skepticism about whether Darwinian natural selection (as opposed to other evolutionary processes) can explain the origins of the language organ that he argues for; I think it is fruitful to consider language as an evolutionary adaptation, like the eye, its major parts designed to carry out important functions. And Chomsky's arguments about the nature of the language faculty are based on technical analyses of word and sentence structure, often couched in abstruse formalisms. His discussions of flesh-and-blood speakers are perfunctory and highly idealized. Though I happen to agree with many of his arguments, I think that a conclusion about the mind is convincing only if many kinds of evidence converge on it. So the story in this book is highly eclectic, ranging from how DNA builds brains to the pontifications of newspaper language columnists. The best place to begin is to ask why anyone should believe that human language is a part of human biology—an instinct—at all.

2



Chatterboxes

By the 1920s it was thought that no corner of the earth fit for human habitation had remained unexplored. New Guinea, the world's second largest island, was no exception. The European missionaries, planters, and administrators clung to its coastal lowlands, convinced that no one could live in the treacherous mountain range that ran in a solid line down the middle of the island. But the mountains visible from each coast in fact belonged to two ranges, not one, and between them was a temperate plateau crossed by many fertile valleys. A million Stone Age people lived in those highlands, isolated from the rest of the world for forty thousand years. The veil would not be lifted until gold was discovered in a tributary of one of the main rivers. The ensuing gold rush attracted Michael Leahy, a footloose Australian prospector, who on May 26, 1930, set out to explore the mountains with a fellow prospector and a group of indigenous lowland people hired as carriers. After scaling the heights, Leahy was amazed to see grassy open country on the other side. By nightfall his amazement turned to alarm, because there were points of light in the distance, obvious signs that the valley was populated. After a sleepless night in which Leahy and his party loaded their weapons and assembled a crude bomb, they

made their first contact with the highlanders. The astonishment was mutual. Leahy wrote in his diary:

It was a relief when the [natives] came in sight, the men . . . in front, armed with bows and arrows, the women behind bringing stalks of sugarcane. When he saw the women, Ewunga told me at once that there would be no fight. We waved to them to come on, which they did cautiously, stopping every few yards to look us over. When a few of them finally got up courage to approach, we could see that they were utterly thunderstruck by our appearance. When I took off my hat, those nearest to me backed away in terror. One old chap came forward gingerly with open mouth, and touched me to see if I was real. Then he knelt down, and rubbed his hands over my bare legs, possibly to find if they were painted, and grabbed me around the knees and hugged them, rubbing his bushy head against me. . . . The women and children gradually got up courage to approach also, and presently the camp was swarming with the lot of them, all running about and jabbering at once, pointing to . . . everything that was new to them.

That "jabbering" was language—an unfamiliar language, one of eight hundred different ones that would be discovered among the isolated highlanders right up through the 1960s. Leahy's first contact repeated a scene that must have taken place hundreds of times in human history, whenever one people first encountered another. All of them, as far as we know, already had language. Every Hottentot, every Eskimo, every Yanomamö. No mute tribe has ever been discovered, and there is no record that a region has served as a "cradle" of language from which it spread to previously languageless groups.

As in every other case, the language spoken by Leahy's hosts turned out to be no mere jabber but a medium that could express abstract concepts, invisible entities, and complex trains of reasoning. The highlanders conferred intensively, trying to agree upon the nature of the pallid apparitions. The leading conjecture was that they were

reincarnated ancestors or other spirits in human form, perhaps ones that turned back into skeletons at night. They agreed upon an empirical test that would settle the matter. "One of the people hid," recalls the highlander Kirupano Eza'e, "and watched them going to excrete. He came back and said, 'Those men from heaven went to excrete over there.' Once they had left many men went to take a look. When they saw that it smelt bad, they said, 'Their skin might be different, but their shit smells bad like ours.'"

The universality of complex language is a discovery that fills linguists with awe, and is the first reason to suspect that language is not just any cultural invention but the product of a special human instinct. Cultural inventions vary widely in their sophistication from society to society; within a society, the inventions are generally at the same level of sophistication. Some groups count by carving notches on bones and cook on fires ignited by spinning sticks in logs; others use computers and microwave ovens. Language, however, ruins this correlation. There are Stone Age societies, but there is no such thing as a Stone Age language. Earlier in this century the anthropological linguist Edward Sapir wrote, "When it comes to linguistic form, Plato walks with the Macedonian swineherd, Confucius with the head-hunting savage of Assam."

To pick an example at random of a sophisticated linguistic form in a nonindustrialized people, the linguist Joan Bresnan recently wrote a technical article comparing a construction in Kivunjo, a Bantu language spoken in several villages on the slopes of Mount Kilimanjaro in Tanzania, with its counterpart construction in English, which she describes as "a West Germanic language spoken in England and its former colonies." The English construction is called the dative* and is found in sentences like *She baked me a brownie* and *He promised her Arpège*, where an indirect object like *me* or *her* is placed after the verb to indicate the beneficiary of an act. The corresponding Kivunjo construction is called the applicative, whose resemblance to the English

*All the technical terms from linguistics, biology, and cognitive science that I use in this book are defined in the Glossary on pages 503–516.

dative, Bresnan notes, "can be likened to that of the game of chess to checkers." The Kivunjo construction fits entirely inside the verb, which has seven prefixes and suffixes, two moods, and fourteen tenses; the verb agrees with its subject, its object, and its benefactive nouns, each of which comes in sixteen genders. (In case you are wondering, these "genders" do not pertain to things like cross-dressers, transsexuals, hermaphrodites, androgynous people, and so on, as one reader of this chapter surmised. To a linguist, the term *gender* retains its original meaning of "kind," as in the related words *generic*, *genus*, and *genre*. The Bantu "genders" refer to kinds like humans, animals, extended objects, clusters of objects, and body parts. It just happens that in many European languages the genders correspond to the sexes, at least in pronouns. For this reason the linguistic term *gender* has been pressed into service by nonlinguists as a convenient label for sexual dimorphism; the more accurate term *sex* seems now to be reserved as the polite way to refer to copulation.) Among the other clever gadgets I have glimpsed in the grammars of so-called primitive groups, the complex Cherokee pronoun system seems especially handy. It distinguishes among "you and I," "another person and I," "several other people and I," and "you, one or more other persons, and I," which English crudely collapses into the all-purpose pronoun *we*.

Actually, the people whose linguistic abilities are most badly underestimated are right here in our society. Linguists repeatedly run up against the myth that working-class people and the less educated members of the middle class speak a simpler or coarser language. This is a pernicious illusion arising from the effortlessness of conversation. Ordinary speech, like color vision or walking, is a paradigm of engineering excellence—a technology that works so well that the user takes its outcome for granted, unaware of the complicated machinery hidden behind the panels. Behind such "simple" sentences as *Where did he go?* and or *The guy I met killed himself*, used automatically by any English speaker, are dozens of subroutines that arrange the words to express the meaning. Despite decades of effort, no artificially engineered language system comes close to duplicating the person in the street, HAL and C3PO notwithstanding.

But though the language engine is invisible to the human user, the trim packages and color schemes are attended to obsessively. Trifling differences between the dialect of the mainstream and the dialect of other groups, like *isn't any* versus *ain't no*, *those books* versus *them books*, and *dragged him away* versus *drug him away*, are dignified as badges of "proper grammar." But they have no more to do with grammatical sophistication than the fact that people in some regions of the United States refer to a certain insect as a *dragonfly* and people in other regions refer to it as a *darning needle*, or that English speakers call canines *dogs* whereas French speakers call them *chiens*. It is even a bit misleading to call Standard English a "language" and these variations "dialects," as if there were some meaningful difference between them. The best definition comes from the linguist Max Weinreich: a language is a dialect with an army and a navy.

The myth that nonstandard dialects of English are grammatically deficient is widespread. In the 1960s some well-meaning educational psychologists announced that American black children had been so culturally deprived that they lacked true language and were confined instead to a "non-logical mode of expressive behavior." The conclusions were based on the students' shy or sullen reactions to batteries of standardized tests. If the psychologists had listened to spontaneous conversations, they would have rediscovered the commonplace fact that American black culture is everywhere highly verbal; the subculture of street youths in particular is famous in the annals of anthropology for the value placed on linguistic virtuosity. Here is an example, from an interview conducted by the linguist William Labov on a stoop in Harlem. The interviewee is Larry, the roughest member of a teenage gang called the Jets. (Labov observes in his scholarly article that "for most readers of this paper, first contact with Larry would produce some fairly negative reactions on both sides.")

You know, like some people say if you're good an' shit, your spirit goin' t'heaven . . . 'n' if you bad, your spirit goin' to hell. Well, bullshit! Your spirit goin' to hell anyway, good or bad.

[Why?]

Why? I'll tell you why. 'Cause, you see, doesn' nobody really know that it's a God, y'know, 'cause I mean I have seen black gods, white gods, all color gods, and don't nobody know it's really a God. An' when they be sayin' if you good, you goin' t'heaven, tha's bullshit, 'cause you ain't goin' to no heaven, 'cause it ain't no heaven for you to go to.

[. . . jus' suppose that there is a God, would he be white or black?]

He'd be white, man.

[Why?]

Why? I'll tell you why. 'Cause the average whitey out here got everything, you dig? And the nigger ain't got shit, y'know? Y'understan'? So—um—for—in order for *that* to happen, you know it ain't no black God that's doin' that bullshit.

First contact with Larry's grammar may produce negative reactions as well, but to a linguist it punctiliously conforms to the rules of the dialect called Black English Vernacular (BEV). The most linguistically interesting thing about the dialect is how linguistically uninteresting it is: if Labov did not have to call attention to it to debunk the claim that ghetto children lack true linguistic competence, it would have been filed away as just another language. Where Standard American English (SAE) uses *there* as a meaningless dummy subject for the copula, BEV uses *it* as a meaningless dummy subject for the copula (compare SAE's *There's really a God* with Larry's *It's really a God*). Larry's negative concord (*You ain't goin' to no heaven*) is seen in many languages, such as French (*ne . . . pas*). Like speakers of SAE, Larry inverts subjects and auxiliaries in nondeclarative sentences, but the exact set of the sentence types allowing inversion differs slightly. Larry and other BEV speakers invert subjects and auxiliaries in negative main clauses like *Don't nobody know*; SAE speakers invert them only in questions like *Doesn't anybody know?* and a few other sentence types. BEV allows its speakers the option of deleting copulas (*If you bad*); this is not random laziness but a systematic rule that is virtually

identical to the contraction rule in SAE that reduces *He is* to *He's*, *You are* to *You're*, and *I am* to *I'm*. In both dialects, *be* can erode only in certain kinds of sentences. No SAE speaker would try the following contractions:

Yes he is! → Yes he's!

I don't care what you are. → I don't care what you're.

Who is it? → Who's it?

For the same reasons, no BEV speaker would try the following deletions:

Yes he is! → Yes he!

I don't care what you are. → I don't care what you.

Who is it? → Who it?

Note, too, that BEV speakers are not just more prone to eroding words. BEV speakers use the full forms of certain auxiliaries (*I have seen*), whereas SAE speakers usually contract them (*I've seen*). And as we would expect from comparisons between languages, there are areas in which BEV is more precise than standard English. *He be working* means that he generally works, perhaps that he has a regular job; *He working* means only that he is working at the moment that the sentence is uttered. In SAE, *He is working* fails to make that distinction. Moreover, sentences like *In order for that to happen, you know it ain't no black God that's doin' that bullshit* show that Larry's speech uses the full inventory of grammatical paraphernalia that computer scientists struggle unsuccessfully to duplicate (relative clauses, complement structures, clause subordination, and so on), not to mention some fairly sophisticated theological argumentation.

Another project of Labov's involved tabulating the percentage of grammatical sentences in tape recordings of speech in a variety of social classes and social settings. "Grammatical," for these purposes, means "well-formed according to consistent rules in the dialect of the speakers." For example, if a speaker asked the question *Where are you going?*, the respondent would not be penalized for answering *To the store*, even though it is in some sense not a complete sentence. Such

ellipses are obviously part of the grammar of conversational English; the alternative, *I am going to the store*, sounds stilted and is almost never used. "Ungrammatical" sentences, by this definition, include randomly broken-off sentence fragments, tongue-tied hemming and hawing, slips of the tongue, and other forms of word salad. The results of Labov's tabulation are enlightening. The great majority of sentences were grammatical, especially in casual speech, with higher percentages of grammatical sentences in working-class speech than in middle-class speech. The highest percentage of ungrammatical sentences was found in the proceedings of learned academic conferences.

The ubiquity of complex language among human beings is a gripping discovery and, for many observers, compelling proof that language is innate. But to tough-minded skeptics like the philosopher Hilary Putnam, it is no proof at all. Not everything that is universal is innate. Just as travelers in previous decades never encountered a tribe without a language, nowadays anthropologists have trouble finding a people beyond the reach of VCR's, Coca-Cola, and Bart Simpson T-shirts. Language was universal before Coca-Cola was, but then, language is more useful than Coca-Cola. It is more like eating with one's hands rather than one's feet, which is also universal, but we need not invoke a special hand-to-mouth instinct to explain why. Language is invaluable for all the activities of daily living in a community of people: preparing food and shelter, loving, arguing, negotiating, teaching. Necessity being the mother of invention, language could have been invented by resourceful people a number of times long ago. (Perhaps, as Lily Tomlin said, man invented language to satisfy his deep need to complain.) Universal grammar would simply reflect the universal exigencies of human experience and the universal limitations on human information processing. All languages have words for "water" and "foot" because all people need to refer to water and feet; no language has a word a million syllables long because no person would have time to say it. Once invented, language would entrench itself within a culture as parents taught their children and children imitated their parents. From cultures that had language, it would spread like

wildfire to other, quieter cultures. At the heart of this process is wondrously flexible human intelligence, with its general multipurpose learning strategies.

So the universality of language does not lead to an innate language instinct as night follows day. To convince you that there is a language instinct, I will have to fill in an argument that leads from the jabbering of modern peoples to the putative genes for grammar. The crucial intervening steps come from my own professional specialty, the study of language development in children. The crux of the argument is that complex language is universal because *children actually reinvent it*, generation after generation—not because they are taught, not because they are generally smart, not because it is useful to them, but because they just can't help it. Let me now take you down this trail of evidence.

The trail begins with the study of how the particular languages we find in the world today arose. Here, one would think, linguistics runs into the problem of any historical science: no one recorded the crucial events at the time they happened. Although historical linguists can trace modern complex languages back to earlier ones, this just pushes the problem back a step; we need to see how people create a complex language from scratch. Amazingly, we can.

The first cases were wrung from two of the more sorrowful episodes of world history, the Atlantic slave trade and indentured servitude in the South Pacific. Perhaps mindful of the Tower of Babel, some of the masters of tobacco, cotton, coffee, and sugar plantations deliberately mixed slaves and laborers from different language backgrounds; others preferred specific ethnicities but had to accept mixtures because that was all that was available. When speakers of different languages have to communicate to carry out practical tasks but do not have the opportunity to learn one another's languages, they develop a makeshift jargon called a pidgin. Pidgins are choppy strings of words borrowed from the language of the colonizers or plantation owners, highly variable in order and with little in the way of grammar. Sometimes a pidgin can become a lingua franca and grad-

ually increase in complexity over decades, as in the "Pidgin English" of the modern South Pacific. (Prince Philip was delighted to learn on a visit to New Guinea that he is referred to in that language as *fella belong Mrs. Queen.*)

But the linguist Derek Bickerton has presented evidence that in many cases a pidgin can be transmuted into a full complex language in one fell swoop: all it takes is for a group of children to be exposed to the pidgin at the age when they acquire their mother tongue. That happened, Bickerton has argued, when children were isolated from their parents and were tended collectively by a worker who spoke to them in the pidgin. Not content to reproduce the fragmentary word strings, the children injected grammatical complexity where none existed before, resulting in a brand-new, richly expressive language. The language that results when children make a pidgin their native tongue is called a creole.

Bickerton's main evidence comes from a unique historical circumstance. Though the slave plantations that spawned most creoles are, fortunately, a thing of the remote past, one episode of creolization occurred recently enough for us to study its principal players. Just before the turn of the century there was a boom in Hawaiian sugar plantations, whose demands for labor quickly outstripped the native pool. Workers were brought in from China, Japan, Korea, Portugal, the Philippines, and Puerto Rico, and a pidgin quickly developed. Many of the immigrant laborers who first developed that pidgin were alive when Bickerton interviewed them in the 1970s. Here are some typical examples of their speech:

Me capé buy, me check make.

Building—high place—wall pat—time—nowtime—an' den—a new tempecha eri time show you.

Good, dis one. Kaukau any-kin' dis one. Pilipine islan' no good. No mo money.

From the individual words and the context, it was possible for the listener to infer that the first speaker, a ninety-two-year-old Japanese immigrant talking about his earlier days as a coffee farmer, was

trying to say "He bought my coffee; he made me out a check." But the utterance itself could just as easily have meant "I bought coffee; I made him out a check," which would have been appropriate if he had been referring to his current situation as a store owner. The second speaker, another elderly Japanese immigrant, had been introduced to the wonders of civilization in Los Angeles by one of his many children, and was saying that there was an electric sign high up on the wall of the building which displayed the time and temperature. The third speaker, a sixty-nine-year-old Filipino, was saying "It's better here than in the Philippines; here you can get all kinds of food, but over there there isn't any money to buy food with." (One of the kinds of food was "pfrawg," which he caught for himself in the marshes by the method of "kank da head.") In all these cases, the speaker's intentions had to be filled in by the listener. The pidgin did not offer the speakers the ordinary grammatical resources to convey these messages—no consistent word order, no prefixes or suffixes, no tense or other temporal and logical markers, no structure more complex than a simple clause, and no consistent way to indicate who did what to whom.

But the children who had grown up in Hawaii beginning in the 1890s and were exposed to the pidgin ended up speaking quite differently. Here are some sentences from the language they invented, Hawaiian Creole. The first two are from a Japanese papaya grower born in Maui; the next two, from a Japanese/Hawaiian ex-plantation laborer born on the big island; the last, from a Hawaiian motel manager, formerly a farmer, born in Kauai:

Da firs japani came ran away from japan come.

"The first Japanese who arrived ran away from Japan to here."

Some filipino wok o'he-ah dey wen' couple ye-ahs in filipin islan'.

"Some Filipinos who worked over here went back to the Philippines for a couple of years."

People no like t'come fo' go wok.

"People don't want to have him go to work [for them]."

One time when we go home inna night dis ting stay fly up.
"Once when we went home at night this thing was flying about."

One day had pleny of dis mountain fish come down.
"One day there were a lot of these fish from the mountains that came down [the river]."

Do not be misled by what look like crudely placed English verbs, such as *go*, *stay*, and *came*, or phrases like *one time*. They are not haphazard uses of English words but systematic uses of Hawaiian Creole grammar: the words have been converted by the creole speakers into auxiliaries, prepositions, case markers, and relative pronouns. In fact, this is probably how many of the grammatical prefixes and suffixes in established languages arose. For example, the English past-tense ending *-ed* may have evolved from the verb *do*: *He hammered* was originally something like *He hammer-did*. Indeed, creoles *are* bona fide languages, with standardized word orders and grammatical markers that were lacking in the pidgin of the immigrants and, aside from the sounds of words, not taken from the language of the colonizers.

Bickerton notes that if the grammar of a creole is largely the product of the minds of children, unadulterated by complex language input from their parents, it should provide a particularly clear window on the innate grammatical machinery of the brain. He argues that creoles from unrelated language mixtures exhibit uncanny resemblances—perhaps even the same basic grammar. This basic grammar also shows up, he suggests, in the errors children make when acquiring more established and embellished languages, like some underlying design bleeding through a veneer of whitewash. When English-speaking children say

Why he is leaving?

Nobody don't likes me.

I'm gonna full Angela's bucket.

Let Daddy hold it hit it,

they are unwittingly producing sentences that are grammatical in many of the world's creoles.

Bickerton's particular claims are controversial, depending as they do on his reconstruction of events that occurred decades or centuries in the past. But his basic idea has been stunningly corroborated by two recent natural experiments in which creolization by children can be observed in real time. These fascinating discoveries are among many that have come from the study of the sign languages of the deaf. Contrary to popular misconceptions, sign languages are not pantomimes and gestures, inventions of educators, or ciphers of the spoken language of the surrounding community. They are found wherever there is a community of deaf people, and each one is a distinct, full language, using the same kinds of grammatical machinery found worldwide in spoken languages. For example, American Sign Language, used by the deaf community in the United States, does not resemble English, or British Sign Language, but relies on agreement and gender systems in a way that is reminiscent of Navajo and Bantu.

Until recently there were no sign languages at all in Nicaragua, because its deaf people remained isolated from one another. When the Sandinista government took over in 1979 and reformed the educational system, the first schools for the deaf were created. The schools focused on drilling the children in lip reading and speech, and as in every case where that is tried, the results were dismal. But it did not matter. On the playgrounds and schoolbuses the children were inventing their own sign system, pooling the makeshift gestures that they used with their families at home. Before long the system congealed into what is now called the *Lenguaje de Signos Nicaragüense* (LSN). Today LSN is used, with varying degrees of fluency, by young deaf adults, aged seventeen to twenty-five, who developed it when they were ten or older. Basically, it is a pidgin. Everyone uses it differently, and the signers depend on suggestive, elaborate circumlocutions rather than on a consistent grammar.

But children like Mayela, who joined the school around the age of four, when LSN was already around, and all the pupils younger than her, are quite different. Their signing is more fluid and compact, and the gestures are more stylized and less like a pantomime. In fact, when their signing is examined close up, it is so different from LSN

that it is referred to by a different name, *Idioma de Signos Nicaragüense* (ISN). LSN and ISN are currently being studied by the psycholinguists Judy Kegl, Miriam Hebe Lopez, and Annie Senghas. ISN appears to be a creole, created in one leap when the younger children were exposed to the pidgin signing of the older children—just as Bickerton would have predicted. ISN has spontaneously standardized itself; all the young children sign it in the same way. The children have introduced many grammatical devices that were absent in LSN, and hence they rely far less on circumlocutions. For example, an LSN (pidgin) signer might make the sign for “talk to” and then point from the position of the talker to the position of the hearer. But an ISN (creole) signer modifies the sign itself, sweeping it in one motion from a point representing the talker to a point representing the hearer. This is a common device in sign languages, formally identical to inflecting a verb for agreement in spoken languages. Thanks to such consistent grammar, ISN is very expressive. A child can watch a surrealistic cartoon and describe its plot to another child. The children use it in jokes, poems, narratives, and life histories, and it is coming to serve as the glue that holds the community together. A language has been born before our eyes.

But ISN was the collective product of many children communicating with one another. If we are to attribute the richness of language to the mind of the child, we really want to see a single child adding some increment of grammatical complexity to the input the child has received. Once again the study of the deaf grants our wish.

When deaf infants are raised by signing parents, they learn sign language in the same way that hearing infants learn spoken language. But deaf children who are not born to deaf parents—the majority of deaf children—often have no access to sign language users as they grow up, and indeed are sometimes deliberately kept from them by educators in the “oralist” tradition who want to force them to master lip reading and speech. (Most deaf people deplore these authoritarian measures.) When deaf children become adults, they tend to seek out deaf communities and begin to acquire the sign language that takes proper advantage of the communicative media available to them. But by then

it is usually too late; they must then struggle with sign language as a difficult intellectual puzzle, much as a hearing adult does in foreign language classes. Their proficiency is notably below that of deaf people who acquired sign language as infants, just as adult immigrants are often permanently burdened with accents and conspicuous grammatical errors. Indeed, because the deaf are virtually the only neurologically normal people who make it to adulthood without having acquired a language, their difficulties offer particularly good evidence that successful language acquisition must take place during a critical window of opportunity in childhood.

The psycholinguists Jenny Singleton and Elissa Newport have studied a nine-year-old profoundly deaf boy, to whom they gave the pseudonym Simon, and his parents, who are also deaf. Simon's parents did not acquire sign language until the late ages of fifteen and sixteen, and as a result they acquired it badly. In ASL, as in many languages, one can move a phrase to the front of a sentence and mark it with a prefix or suffix (in ASL, raised eyebrows and a lifted chin) to indicate that it is the topic of the sentence. The English sentence *Elvis I really like* is a rough equivalent. But Simon's parents rarely used this construction and mangled it when they did. For example, Simon's father once tried to sign the thought *My friend, he thought my second child was deaf*. It came out as *My friend thought, my second child, he thought he was deaf*—a bit of sign salad that violates not only ASL grammar but, according to Chomsky's theory, the Universal Grammar that governs all naturally acquired human languages (later in this chapter we will see why). Simon's parents had also failed to grasp the verb inflection system of ASL. In ASL, the verb *to blow* is signed by opening a fist held horizontally in front of the mouth (like a puff of air). Any verb in ASL can be modified to indicate that the action is being done continuously: the signer superimposes an arclike motion on the sign and repeats it quickly. A verb can also be modified to indicate that the action is being done to more than one object (for example, several candles): the signer terminates the sign in one location in space, then repeats it but terminates it at another location. These inflections can be combined in either of two orders: *blow*

toward the left and then toward the right and repeat, or *blow* toward the left twice and then *blow* toward the right twice. The first order means "to blow out the candles on one cake, then another cake, then the first cake again, then the second cake again"; the second means "to blow out the candles on one cake continuously, and then blow out the candles on another cake continuously." This elegant set of rules was lost on Simon's parents. They used the inflections inconsistently and never combined them onto a verb two at a time, though they would occasionally use the inflections separately, crudely linked with signs like *then*. In many ways Simon's parents were like pidgin speakers.

Astoundingly, though Simon saw no ASL but his parents' defective version, his own signing was far better ASL than theirs. He understood sentences with moved topic phrases without difficulty, and when he had to describe complex videotaped events, he used the ASL verb inflections almost perfectly, even in sentences requiring two of them in particular orders. Simon must somehow have shut out his parents' ungrammatical "noise." He must have latched on to the inflections that his parents used inconsistently, and reinterpreted them as mandatory. And he must have seen the logic that was implicit, though never realized, in his parents' use of two kinds of verb inflection, and reinvented the ASL system of superimposing both of them onto a single verb in a specific order. Simon's superiority to his parents is an example of creolization by a single living child.

Actually, Simon's achievements are remarkable only because he is the first one who showed them to a psycholinguist. There must be thousands of Simons: ninety to ninety-five percent of deaf children are born to hearing parents. Children fortunate enough to be exposed to ASL at all often get it from hearing parents who themselves learned it, incompletely, to communicate with their children. Indeed, as the transition from LSN to ISN shows, sign languages themselves are surely products of creolization. Educators at various points in history have tried to invent sign systems, sometimes based on the surrounding spoken language. But these crude codes are always unlearnable, and

when deaf children learn from them at all, they do so by converting them into much richer natural languages.

Extraordinary acts of creation by children do not require the extraordinary circumstances of deafness or plantation Babels. The same kind of linguistic genius is involved every time a child learns his or her mother tongue.

First, let us do away with the folklore that parents teach their children language. No one supposes that parents provide explicit grammar lessons, of course, but many parents (and some child psychologists who should know better) think that mothers provide children with implicit lessons. These lessons take the form of a special speech variety called Motherese (or, as the French call it, *Mamanaise*): intensive sessions of conversational give-and-take, with repetitive drills and simplified grammar. ("Look at the *doggie*! See the *doggie*? There's a *doggie*!") In contemporary middle-class American culture, parenting is seen as an awesome responsibility, an unforgiving vigil to keep the helpless infant from falling behind in the great race of life. The belief that Motherese is essential to language development is part of the same mentality that sends yuppies to "learning centers" to buy little mittens with bull's-eyes to help their babies find their hands sooner.

One gets some perspective by examining the folk theories about parenting in other cultures. The !Kung San of the Kalahari Desert in southern Africa believe that children must be drilled to sit, stand, and walk. They carefully pile sand around their infants to prop them upright, and sure enough, every one of these infants soon sits up on its own. We find this amusing because we have observed the results of the experiment that the San are unwilling to chance: we don't teach our children to sit, stand, and walk, and they do it anyway, on their own schedule. But other groups enjoy the same condescension toward us. In many communities of the world, parents do not indulge their children in Motherese. In fact, they do not speak to their prelinguistic children at all, except for occasional demands and rebukes. This is not unreasonable. After all, young children plainly can't understand a word you say. So why waste your breath in soliloquies? Any sensible

person would surely wait until a child has developed speech and more gratifying two-way conversations become possible. As Aunt Mae, a woman living in the South Carolina Piedmont, explained to the anthropologist Shirley Brice Heath: "Now just how crazy is dat? White folks uh hear dey kids say sump'n, dey say it back to 'em, dey aks 'em 'gain and 'gain 'bout things, like they 'posed to be born knowin'." Needless to say, the children in these communities, over-hearing adults and other children, learn to talk, as we see in Aunt Mae's fully grammatical BEV.

Children deserve most of the credit for the language they acquire. In fact, we can show that they know things they could not have been taught. One of Chomsky's classic illustrations of the logic of language involves the process of moving words around to form questions. Consider how you might turn the declarative sentence *A unicorn is in the garden* into the corresponding question, *Is a unicorn in the garden*? You could scan the declarative sentence, take the auxiliary *is*, and move it to the front of the sentence:

a unicorn is in the garden. →
is a unicorn the garden?

Now take the sentence *A unicorn that is eating a flower is in the garden*. There are two *is*'s. Which gets moved? Obviously, not the first one hit by the scan; that would give you a very odd sentence:

a unicorn that is eating a flower is in the garden. →
is a unicorn that eating a flower is in the garden?

But why can't you move that *is*? Where did the simple procedure go wrong? The answer, Chomsky noted, comes from the basic design of language. Though sentences are strings of words, our mental algorithms for grammar do not pick out words by their linear positions, such as "first word," "second word," and so on. Rather, the algorithms group words into phrases, and phrases into even bigger phrases, and give each one a mental label, like "subject noun phrase" or "verb phrase." The real rule for forming questions does not look for the first occurrence of the auxiliary word as one goes from left to

right in the string; it looks for the auxiliary that comes after the phrase labeled as the subject. This phrase, containing the entire string of words *a unicorn that is eating a flower*, behaves as a single unit. The first *is* sits deeply buried in it, invisible to the question-forming rule. The second *is*, coming immediately after this subject noun phrase, is the one that is moved:

[a unicorn that is eating a flower] is in the garden. →
is [a unicorn that is eating a flower] in the garden?

Chomsky reasoned that if the logic of language is wired into children, then the first time they are confronted with a sentence with two auxiliaries they should be capable of turning it into a question with the proper wording. This should be true even though the wrong rule, the one that scans the sentence as a linear string of words, is simpler and presumably easier to learn. And it should be true even though the sentences that would teach children that the linear rule is wrong and the structure-sensitive rule is right—questions with a second auxiliary embedded inside the subject phrase—are so rare as to be nonexistent in Motherese. Surely not every child learning English has heard Mother say *Is the doggie that is eating the flower in the garden?* For Chomsky, this kind of reasoning, which he calls “the argument from the poverty of the input,” is the primary justification for saying that the basic design of language is innate.

Chomsky's claim was tested in an experiment with three-, four-, and five-year-olds at a daycare center by the psycholinguists Stephen Crain and Mineharu Nakayama. One of the experimenters controlled a doll of Jabba the Hutt, of *Star Wars* fame. The other coaxed the child to ask a set of questions, by saying, for example, “Ask Jabba if the boy who is unhappy is watching Mickey Mouse.” Jabba would inspect a picture and answer yes or no, but it was really the child who was being tested, not Jabba. The children cheerfully provided the appropriate questions, and, as Chomsky would have predicted, not a single one of them came up with an ungrammatical string like *Is the boy who unhappy is watching Mickey Mouse?*, which the simple linear rule would have produced.

Now, you may object that this does not show that children's brains register the subject of a sentence. Perhaps the children were just going by the meanings of the words. *The man who is running* refers to a single actor playing a distinct role in the picture, and children could have been keeping track of which words are about particular actors, not which words belong to the subject noun phrase. But Crain and Nakayama anticipated the objection. Mixed into their list were commands like “Ask Jabba if it is raining in this picture.” The *it* of the sentence, of course, does not refer to anything; it is a dummy element that is there only to satisfy the rules of syntax, which demand a subject. But the English question rule treats it just like any other subject: *Is it raining?* Now, how do children cope with this meaningless placeholder? Perhaps they are as literal-minded as the Duck in *Alice's Adventures in Wonderland*:

“I proceed [said the Mouse]. ‘Edwin and Morcar, the earls of Mercia and Northumbria, declared for him; and even Stigand, the patriotic archbishop of Canterbury, found it advisable—’ ”

“Found *what?*” said the Duck.

“Found *it*,” the Mouse replied rather crossly: “of course you know what ‘it’ means.”

“I know what ‘it’ means well enough, when *I* find a thing,” said the Duck: “it’s generally a frog, or a worm. The question is, what did the archbishop find?”

But children are not ducks. Crain and Nakayama's children replied, *Is it raining in this picture?* Similarly, they had no trouble forming question with other dummy subjects, as in “Ask Jabba if there is a snake in this picture,” or with subjects that are not things, as in “Ask Jabba if running is fun” and “Ask Jabba if love is good or bad.”

The universal constraints on grammatical rules also show that the basic form of language cannot be explained away as the inevitable outcome of a drive for usefulness. Many languages, widely scattered over the globe, have auxiliaries, and like English, many languages move the auxiliary to the front of the sentence to form questions and other constructions, always in a structure-dependent way. But this is

not the only way one could design a question rule. One could just as effectively move the leftmost auxiliary in the string to the front, or flip the first and last words, or utter the entire sentence in mirror-reversed order (a trick that the human mind is capable of; some people learn to talk backwards to amuse themselves and amaze their friends). The particular ways that languages do form questions are arbitrary, species-wide conventions; we don't find them in artificial systems like computer programming languages or the notation of mathematics. The universal plan underlying languages, with auxiliaries and inversion rules, nouns and verbs, subjects and objects, phrases and clauses, case and agreement, and so on, seems to suggest a commonality in the brains of speakers, because many other plans would have been just as useful. It is as if isolated inventors miraculously came up with identical standards for typewriter keyboards or Morse code or traffic signals.

Evidence corroborating the claim that the mind contains blueprints for grammatical rules comes, once again, out of the mouths of babes and sucklings. Take the English agreement suffix *-s* as in *He walks*. Agreement is an important process in many languages, but in modern English it is superfluous, a remnant of a richer system that flourished in Old English. If it were to disappear entirely, we would not miss it, any more than we miss the similar *-est* suffix in *Thou sayest*. But psychologically speaking, this frill does not come cheap. Any speaker committed to using it has to keep track of four details in every sentence uttered:

- whether the subject is in the third person or not: *He walks* versus *I walk*.
- whether the subject is singular or plural: *He walks* versus *They walk*.
- whether the action is present tense or not: *He walks* versus *He walked*.
- whether the action is habitual or going on at the moment of speaking (its "aspect"): *He walks to school* versus *He is walking to school*.

And all this work is needed just to use the suffix once one has learned it. To learn it in the first place, a child must (1) notice that verbs end

in *-s* in some sentences but appear bare-ended in others, (2) begin a search for the grammatical causes of this variation (as opposed to just accepting it as part of the spice of life), and (3) not rest until those crucial factors—tense, aspect, and the number and person of the subject of the sentence—have been sifted out of the ocean of conceivable but irrelevant factors (like the number of syllables of the final word in the sentence, whether the object of a preposition is natural or man-made, and how warm it is when the sentence is uttered). Why would anyone bother?

But little children do bother. By the age of three and a half or earlier, they use the *-s* agreement suffix in more than ninety percent of the sentences that require it, and virtually never use it in the sentences that forbid it. This mastery is part of their grammar explosion, a period of several months in the third year of life during which children suddenly begin to speak in fluent sentences, respecting most of the fine points of their community's spoken language. For example, a preschooler with the pseudonym Sarah, whose parents had only a high school education, can be seen obeying the English agreement rule, useless though it is, in complex sentences like the following:

When my mother *hangs* clothes, do you let 'em rinse out in rain?

Donna *teases* all the time and Donna has false teeth.

I know what a big chicken *looks* like.

Anybody *knows* how to scribble.

Hey, this part *goes* where this one is, stupid.

What *comes* after "C"?

It *looks* like a donkey face.

The person *takes* care of the animals in the barn.

After it *dries* off then you can make the bottom.

Well, someone *hurts* himself and everything.

His tail *sticks* out like this.

What *happens* if ya press on this hard?

Do you have a real baby that *says* googoo gaga?

Just as interestingly, Sarah could not have been simply imitating her parents, memorizing verbs with the *-s*'s pre-attached. Sarah some-

times uttered word forms that she could not possibly have heard from her parents:

When she *be's* in the kindergarten . . .
 He's a boy so he *gots* a scary one. [costume]
 She *do's* what her mother tells her.

She must, then, have created these forms herself, using an unconscious version of the English agreement rule. The very concept of imitation is suspect to begin with (if children are general imitators, why don't they imitate their parents' habit of sitting quietly in airplanes?), but sentences like these show clearly that language acquisition cannot be explained as a kind of imitation.

One step remains to complete the argument that language is a specific instinct, not just the clever solution to a problem thought up by a generally brainy species. If language is an instinct, it should have an identifiable seat in the brain, and perhaps even a special set of genes that help wire it into place. Disrupt these genes or neurons, and language should suffer while the other parts of intelligence carry on; spare them in an otherwise damaged brain, and you should have a retarded individual with intact language, a linguistic idiot savant. If, on the other hand, language is just the exercise of human smarts, we might expect that injuries and impairments would make people stupider across the board, including their language. The only pattern we would expect is that the more brain tissue that is damaged, the duller and less articulate the person should be.

No one has yet located a language organ or a grammar gene, but the search is on. There are several kinds of neurological and genetic impairments that compromise language while sparing cognition and vice versa. One of them has been known for over a century, perhaps for millennia. When there is damage to certain circuits in the lower parts of the frontal lobe of the brain's left hemisphere—say, from a stroke or bullet wound—the person often suffers from a syndrome called Broca's aphasia. One of these victims, who eventually recovered

his language ability, recalls the event, which he experienced with complete lucidity:

When I woke up I had a bit of a headache and thought I must have been sleeping with my right arm under me because it felt all pins-and-needly and numb and I couldn't make it do what I wanted. I got out of bed but I couldn't stand; as a matter of fact I actually fell on the floor because my right leg was too weak to take my weight. I called out to my wife in the next room and no sound came—I couldn't speak. . . . I was astonished, horrified. I couldn't believe that this was happening to me and I began to feel bewildered and frightened and then I suddenly realized that I must have had a stroke. In a way this rationalization made me feel somewhat relieved but not for long because I had always thought that the effects of a stroke were permanent in every case. . . . I found I could speak a little but even to me the words seemed wrong and not what I meant to say.

As this writer noted, most stroke victims are not as lucky. Mr. Ford was a Coast Guard radio operator when he suffered a stroke at the age of thirty-nine. The neuropsychologist Howard Gardner interviewed him three months later. Gardner asked him about his work before he entered the hospital.

"I'm a sig . . . no . . . man . . . uh, well, . . . again." These words were emitted slowly, and with great effort. The sounds were not clearly articulated; each syllable was uttered harshly, explosively, in a throaty voice. . . .

"Let me help you," I interjected. "You were a signal . . ."

"A sig-nal man . . . right," Ford completed my phrase triumphantly.

"Were you in the Coast Guard?"

"No, er, yes, yes . . . ship . . . Massachu . . . chusetts . . . Coast-guard . . . years." He raised his hands twice, indicating the number "nineteen."

"Oh, you were in the Coast Guard for nineteen years."

"Oh . . . boy . . . right . . . right," he replied.

"Why are you in the hospital, Mr. Ford?"

Ford looked at me a bit strangely, as if to say, Isn't it patently obvious? He pointed to his paralyzed arm and said, "Arm no good," then to his mouth and said, "Speech . . . can't say . . . talk, you see."

"What happened to you to make you lose your speech?"

"Head, fall, Jesus Christ, me no good, str, str . . . oh Jesus . . . stroke."

"I see. Could you tell me, Mr. Ford, what you've been doing in the hospital?"

"Yes, sure. Me go, er, uh, P.T. nine o'clock, speech . . . two times . . . read . . . wr . . . ripe, er, rike, er, write . . . practice . . . get-ting better."

"And have you been going home on weekends?"

"Why, yes . . . Thursday, er, er, er, no, er, Friday . . . Bar-ba-ra . . . wife . . . and, oh, car . . . drive . . . purnpike . . . you know . . . rest and . . . tee-vee."

"Are you able to understand everything on television?"

"Oh, yes, yes . . . well . . . al-most."

Obviously Mr. Ford had to struggle to get speech out, but his problems were not in controlling his vocal muscles. He could blow out a candle and clear his throat, and he was as linguistically hobbled when he wrote as when he spoke. Most of his handicaps centered around grammar itself. He omitted endings like *-ed* and *-s* and grammatical function words like *or*, *be*, and *the*, despite their high frequency in the language. When reading aloud, he skipped over the function words, though he successfully read content words like *bee* and *oar* that had the same sounds. He named objects and recognized their names extremely well. He understood questions when their gist could be deduced from their content words, such as "Does a stone float on water?" or "Do you use a hammer for cutting?" but not one that requires grammatical analysis, like "The lion was killed by the tiger; which one is dead?"

Despite Mr. Ford's grammatical impairment, he was clearly in command of his other faculties. Gardner notes: "He was alert, attentive, and fully aware of where he was and why he was there. Intellectual functions not closely tied to language, such as knowledge of right and left, ability to draw with the left (unpracticed) hand, to calculate, read maps, set clocks, make constructions, or carry out commands, were all preserved. His Intelligence Quotient in nonverbal areas was in the high average range." Indeed, the dialogue shows that Mr. Ford, like many Broca's aphasics, showed an acute understanding of his handicap.

Injuries in adulthood are not the only ways that the circuitry underlying language can be compromised. A few otherwise healthy children just fail to develop language on schedule. When they do begin to talk, they have difficulty articulating words, and though their articulation improves with age, the victims persist in a variety of grammatical errors, often into adulthood. When obvious nonlinguistic causes are ruled out—cognitive disorders like retardation, perceptual disorders like deafness, and social disorders like autism—the children are given the accurate but not terribly helpful diagnostic label Specific Language Impairment (SLI).

Language therapists, who are often called upon to treat several members in a family, have long been under the impression that SLI is hereditary. Recent statistical studies show that the impression may be correct. SLI runs in families, and if one member of a set of identical twins has it, the odds are very high that the other will, too. Particularly dramatic evidence comes from one British family, the K's, recently studied by the linguist Myrna Gopnik and several geneticists. The grandmother of the family is language-impaired. She has five adult children. One daughter is linguistically normal, as are this daughter's children. The other four adults, like the grandmother, are impaired. Together these four had twenty-three children; of them, eleven were language-impaired, twelve were normal. The language-impaired children were randomly distributed among the families, the sexes, and the birth orders.

Of course, the mere fact that some behavioral pattern runs in

families does not show that it is genetic. Recipes, accents, and lullabies run in families, but they have nothing to do with DNA. In this case, though, a genetic cause is plausible. If the cause were in the environment—poor nutrition, hearing the defective speech of an impaired parent or sibling, watching too much TV, lead contamination from old pipes, whatever—then why would the syndrome capriciously strike some family members while leaving their near age-mates (in one case, a fraternal twin) alone? In fact, the geneticists working with Gopnik noted that the pedigree suggests a trait controlled by a single dominant gene, just like pink flowers on Gregor Mendel's pea plants.

What does this hypothetical gene do? It does not seem to impair overall intelligence; most of the afflicted family members score in the normal range in the nonverbal parts of IQ tests. (Indeed, Gopnik studied one unrelated child with the syndrome who routinely received the best grade in his mainstream math class.) It is their language that is impaired, but they are not like Broca's aphasics; the impression is more of a tourist struggling in a foreign city. They speak somewhat slowly and deliberately, carefully planning what they will say and encouraging their interlocutors to come to their aid by completing sentences for them. They report that ordinary conversation is strenuous mental work and that when possible they avoid situations in which they must speak. Their speech contains frequent grammatical errors, such as misuse of pronouns and of suffixes like the plural and past tense:

It's a flying finches, they are.
 She remembered when she hurts herself the other day.
 The neighbors phone the ambulance because the man fall
 off the tree.
 They boys eat four cookies.
 Carol is cry in the church.

In experimental tests they have difficulty with tasks that normal four-year-olds breeze through. A classic example is the *wug*-test, another demonstration that normal children do not learn language by imitating their parents. The testee is shown a line drawing of a birdlike

creature and told that it is a *wug*. Then a picture of two of them is shown, and the child is told, "Now there are two of them; there are two ____." Your typical four-year-old will blurt out *wugs*, but the language-impaired adult is stymied. One of the adults Gopnik studied laughed nervously and said, "Oh, dear, well carry on." When pressed, she responded, "Wug . . . wugness, isn't it? No. I see. You want to pair . . . pair it up. OK." For the next animal, *zat*, she said, "Za . . . ka . . . za . . . zackle." For the next, *sas*, she deduced that it must be "sasses." Flushed with success, she proceeded to generalize too literally, converting *zoop* to "zoop-es" and *tob* to "tob-ye-es," revealing that she hadn't really grasped the English rule. Apparently the defective gene in this family somehow affects the development of the rules that normal children use unconsciously. The adults do their best to compensate by consciously reasoning the rules out, with predictably clumsy results.

Broca's aphasia and SLI are cases where language is impaired and the rest of intelligence seems more or less intact. But this does not show that language is separate from intelligence. Perhaps language imposes greater demands on the brain than any other problem the mind has to solve. For the other problems, the brain can limp along at less than its full capacity; for language, all systems have to be one hundred percent. To clinch the case, we need to find the opposite dissociation, linguistic idiot savants—that is, people with good language and bad cognition.

Here is another interview, this one between a fourteen-year-old girl called Denyse and the late psycholinguist Richard Cromer; the interview was transcribed and analyzed by Cromer's colleague Sigrid Lipka.

I like opening cards. I had a pile of post this morning and not one of them was a Christmas card. A bank statement I got this morning!

[A bank statement? I hope it was good news.]

No it wasn't good news.

[Sounds like mine.]

I hate . . . , My mum works over at the, over on the ward and she said "not another bank statement." I said "it's the second one in two days." And she said "Do you want me to go to the bank for you at lunchtime?" and I went "No, I'll go this time and explain it myself." I tell you what, my bank are awful. They've lost my bank book, you see, and I can't find it anywhere. I belong to the TSB Bank and I'm thinking of changing my bank 'cause they're so awful.

They keep, they keep losing . . . [someone comes in to bring some tea] Oh, isn't that nice.

[Uhm. Very good.]

They've got the habit of doing that. They lose, they've lost my bank book twice, in a month, and I think I'll scream. My mum went yesterday to the bank for me. She said "They've lost your bank book again." I went "Can I scream?" and I went, she went "Yes, go on." So I hollered. But it is annoying when they do things like that. TSB, Trustees aren't . . . uh the best ones to be with actually. They're hopeless.

I have seen Denyse on videotape, and she comes across as a loquacious, sophisticated conversationalist—all the more so, to American ears, because of her refined British accent. (*My bank are awful*, by the way, is grammatical in British, though not American, English.) It comes as a surprise to learn that the events she relates so earnestly are figments of her imagination. Denyse has no bank account, so she could not have received any statement in the mail, nor could her bank have lost her bankbook. Though she would talk about a joint bank account she shared with her boyfriend, she had no boyfriend, and obviously had only the most tenuous grasp of the concept "joint bank account" because she complained about the boyfriend taking money out of her side of the account. In other conversations Denyse would engage her listeners with lively tales about the wedding of her sister, her holiday in Scotland with a boy named Danny, and a happy airport reunion with a long-estranged father. But Denyse's sister is unmar-

ried, Denyse has never been to Scotland, she does not know anyone named Danny, and her father has never been away for any length of time. In fact, Denyse is severely retarded. She never learned to read or write and cannot handle money or any of the other demands of everyday functioning.

Denyse was born with spina bifida ("split spine") a malformation of the vertebrae that leaves the spinal cord unprotected. Spina bifida often results in hydrocephalus, an increase in pressure in the cerebrospinal fluid filling the ventricles (large cavities) of the brain, distending the brain from within. For reasons no one understands, hydrocephalic children occasionally end up like Denyse, significantly retarded but with unimpaired—indeed, overdeveloped—language skills. (Perhaps the ballooning ventricles crush much of the brain tissue necessary for everyday intelligence but leave intact some other portions that can develop language circuitry.) The various technical terms for the condition include "cocktail party conversation," "chatterbox syndrome," and "blathering."

Fluent grammatical language can in fact appear in many kinds of people with severe intellectual impairments, like schizophrenics, Alzheimer's patients, some autistic children, and some aphasics. One of the most fascinating syndromes recently came to light when the parents of a retarded girl with chatterbox syndrome in San Diego read an article about Chomsky's theories in a popular science magazine and called him at MIT, suggesting that their daughter might be of interest to him. Chomsky is a paper-and-pencil theoretician who wouldn't know Jabba the Hutt from the Cookie Monster, so he suggested that the parents bring their child to the laboratory of the psycholinguist Ursula Bellugi in La Jolla.

Bellugi, working with colleagues in molecular biology, neurology, and radiology, found that the child (whom they called Crystal), and a number of others they have subsequently tested, had a rare form of retardation called Williams syndrome. The syndrome seems to be associated with a defective gene on chromosome 11 involved in the regulation of calcium, and it acts in complex ways on the brain, skull, and internal organs during development, though no one knows why

it has the effects it does. The children have an unusual appearance: they are short and slight, with narrow faces and broad foreheads, flat nasal bridges, sharp chins, star-shaped patterns in their irises, and full lips. They are sometimes called "elfin-faced" or "pixie people," but to me they look more like Mick Jagger. They are significantly retarded, with an IQ of about 50, and are incompetent at ordinary tasks like tying their shoes, finding their way, retrieving items from a cupboard, telling left from right, adding two numbers, drawing a bicycle, and suppressing their natural tendency to hug strangers. But like Denyse they are fluent, if somewhat prim, conversationalists. Here are two transcripts from Crystal when she was eighteen:

And what an elephant is, it is one of the animals. And what the elephant does, it lives in the jungle. I can also live in the zoo. And what it has, it has long, gray ears, fan ears, ears that can blow in the wind. It has a long trunk that can pick up grass or pick up hay . . . If they're in a bad mood, it can be terrible . . . If the elephant gets mad, it could stomp; it could charge. Sometimes elephants can charge, like a bull can charge. They have big, long, tusks. They can damage a car . . . It could be dangerous. When they're in a pinch, when they're in a bad mood, it can be terrible. You don't want an elephant as a pet. You want a cat or a dog or a bird.

This is a story about chocolates. Once upon a time, in Chocolate World there used to be a Chocolate Princess. She was such a yummy princess. She was on her chocolate throne and then some chocolate man came to see her. And the man bowed to her and he said these words to her. The man said to her, "Please, Princess Chocolate. I want you to see how I do my work. And it's hot outside in Chocolate World, and you might melt to the ground like melted butter. And if the sun changes to a different color, then the Chocolate World—and you—won't melt. You can be saved if the sun changes to a different color. And if it doesn't change to a different color, you and Chocolate World are doomed.

Laboratory tests confirm the impression of competence at grammar; the children understand complex sentences, and fix up ungrammatical sentences, at normal levels. And they have an especially charming quirk: they are fond of unusual words. Ask a normal child to name some animals, and you will get the standard inventory of pet store and barnyard: dog, cat, horse, cow, pig. Ask a Williams syndrome child, and you get a more interesting menagerie: unicorn, pteranodon, yak, ibex, water buffalo, sea lion, saber-tooth tiger, vulture, koala, dragon, and one that should be especially interesting to paleontologists, "brontosaurus rex." One eleven-year-old poured a glass of milk into the sink and said, "I'll have to evacuate it"; another handed Bellugi a drawing and announced, "Here, Doc, this is in remembrance of you."

People like Kirupano, Larry, the Hawaiian-born papaya grower, May-ela, Simon, Aunt Mac, Sarah, Mr. Ford, the K's, Denyse, and Crystal constitute a field guide to language users. They show that complex grammar is displayed across the full range of human habitats. You don't need to have left the Stone Age; you don't need to be middle class; you don't need to do well in school; you don't even need to be old enough for school. Your parents need not bathe you in language or even command a language. You don't need the intellectual withal to function in society, the skills to keep house and home together, or a particularly firm grip on reality. Indeed, you can possess all these advantages and still not be a competent language user, if you lack just the right genes or just the right bits of brain.