in the 1960s, provides a famous example. The sentence *Time flies like an arrow* is surely unambiguous if there ever was an unambiguous sentence (ignoring the difference between literal and metaphorical meanings, which have nothing to do with syntax). But to the surprise of the programmers, the sharp-eyed computer found it to have five different trees!

> Time proceeds as quickly as an arrow proceeds. (the intended reading)
> Measure the speed of flies in the same way that you measure the speed of an arrow.
> Measure the speed of flies in the same way that an arrow measures the speed of flies.
> Measure the speed of flies that resemble an arrow.
> Flies of a particular kind, time-flies, are fond of an arrow.

Among computer scientists the discovery has been summed up in the aphorism "Time flies like an arrow; fruit flies like a banana." Or consider the song line *Mary had a little lamb.* Unambiguous? Imagine that the second line was: *With mint sauce.* Or: *And the doctors were surprised.* Or: *The tramp!* There is even structure in seemingly nonsensical lists of words. For example, this fiendish string devised by my student Annie Senghas is a grammatical sentence:

> Buffalo buffalo Buffalo buffalo buffalo buffalo Buffalo buffalo.

American bison are called *buffalo.* A kind of bison that comes from Buffalo, New York, could be called a *Buffalo buffalo.* Recall that there is a verb *to buffalo* that means "to overwhelm, to intimidate." Imagine that New York State bison intimidate one another: *(The) Buffalo buffalo (that) Buffalo buffalo (often) buffalo (in turn) buffalo (other) Buffalo buffalo.* The psycholinguist and philosopher Jerry Fodor has observed that a Yale University football cheer

> Bulldogs Bulldogs Bulldogs Fight Fight Fight!

is a grammatical sentence, albeit a triply center-embedded one.

How do people home in on the sensible analysis of a sentence, without tarrying over all the grammatically legitimate but bizarre alternatives? There are two possibilities. One is that our brains are like computer parsers, computing dozens of doomed tree fragments in the background, and the unlikely ones are somehow filtered out before they reach consciousness. The other is that the human parser somehow gambles at each step about the alternative most likely to be true and then plows ahead with that single interpretation as far as possible. Computer scientists call these alternatives "breadth-first search" and "depth-first search."

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At the level of individual words, it looks as if the brain does a breadth-first search, entertaining, however briefly, several entries for an ambiguous word, even unlikely ones. In an ingenious experiment, the psycholinguist David Swinney had people listen over headphones to passages like the following:

> Rumor had it that, for years, the government building had been plagued with problems. The man was not surprised when he found several spiders, roaches, and other bugs in the corner of his room.

Did you notice that the last sentence contains an ambiguous word, *bug,* which can mean either "insect" or "surveillance device"? Probably not; the second meaning is more obscure and makes no sense in context. But psycholinguists are interested in mental processes that last only milliseconds and need a more subtle technique than just asking people. As soon as the word *bug* had been read from the tape, a computer flashed a word on a screen, and the person had to press a button as soon as he or she had recognized it. (Another button was available for nonwords like *blick.*) It is well known that when a person hears one word, any word related to it is easier to recognize, as if the mental dictionary is organized like a thesaurus, so that when one word is found, others similar in meaning are more readily available. As expected, people pressed the button faster when recognizing *ant,* which is related to *bug,* than when recognizing *sew,* which is unrelated. Surprisingly, people were just as primed to recognize the word *spy,* which is, of course, related to *bug,* but only to the meaning that makes

no sense in the context. It suggests that the brain knee-jerkingly activates both entries for *bug,* even though one of them could sensibly be ruled out beforehand. The irrelevant meaning is not around long: if the test word appeared on the screen three syllables after *bugs* instead of right after it, then only *ant* was recognized quickly; *spy* was no longer any faster than *sew*. Presumably that is why people deny that they even entertain the inappropriate meaning.

The psychologists Mark Seidenberg and Michael Tanenhaus showed the same effect for words that were ambiguous as to part-of-speech category, like *tires,* which we encountered in the ambiguous headline *Stud Tires Out.* Regardless of whether the word appeared in a noun position, like *The tires . . .* , or in a verb position, like *He tires . . .* , the word primed both *wheels,* which is related to the noun meaning, and *fatigue,* which is related to the verb meaning. Mental dictionary lookup, then, is quick and thorough but not very bright; it retrieves nonsensical entries that must be weeded out later.

At the level of the phrases and sentences that span many words, though, people clearly are not computing every possible tree for a sentence. We know this for two reasons. One is that many sensible ambiguities are simply never recognized. How else can we explain the ambiguous newspaper passages that escaped the notice of editors, no doubt to their horror later on? I cannot resist quoting some more:

> The judge sentenced the killer to die in the electric chair for the second time.
>
> Dr. Tackett Gives Talk on Moon
>
> No one was injured in the blast, which was attributed to the buildup of gas by one town official.
>
> The summary of information contains totals of the number of students broken down by sex, marital status, and age.

I once read a book jacket flap that said that the author lived with her husband, an architect and an amateur musician in Cheshire, Connecticut. For a moment I thought it was a ménage à quatre.

Not only do people fail to find some of the trees that are consistent with a sentence; sometimes they stubbornly fail to find the *only* tree that is consistent with a sentence. Take these sentences:

> The horse raced past the barn fell.
>
> The man who hunts ducks out on weekends.
>
> The cotton clothing is usually made of grows in Mississippi.
>
> The prime number few.
>
> Fat people eat accumulates.
>
> The tycoon sold the offshore oil tracts for a lot of money wanted to kill JR.

Most people proceed contendedly through the sentence up to a certain point, then hit a wall and frantically look back to earlier words to try to figure out where they went wrong. Often the attempt fails and people assume that the sentences have an extra word tacked onto the end or consist of two pieces of sentence stitched together. In fact, each one is a grammatical sentence:

> The horse that was walked past the fence proceeded steadily, but the horse raced past the barn fell.
>
> The man who fishes goes into work seven days a week, but the man who hunts ducks out on weekends.
>
> The cotton that sheets are usually made of grows in Egypt, but the cotton clothing is usually made of grows in Mississippi.
>
> The mediocre are numerous, but the prime number few.
>
> Carbohydrates that people eat are quickly broken down, but fat people eat accumulates.
>
> JR Ewing had swindled one tycoon too many into buying useless properties. The tycoon sold the offshore oil tracts for a lot of money wanted to kill JR.

These are called garden path sentences, because their first words lead the listener "up the garden path" to an incorrect analysis. Garden path sentences show that people, unlike computers, do not build all possible trees as they go along; if they did, the correct tree would be among them. Rather, people mainly use a depth-first strategy, picking