Language is endlessly variable. Each of us can come up with

an infinite number of sentences in our native language, and

we’re able to do so from an early age— almost as soon as we start to communicate in sentences.

How is this possible? In the early 1950s, Noam Chomsky proposed a theory

based on the observation that the key to this versatility seems to be grammar:

the familiar grammatical structure of an unfamiliar sentence points us toward its meaning.

He suggested that there are grammatical rules that apply to all languages,

and that the rules are innate— the human brain is hardwired to process

language according to these rules.

He labelled this faculty universal grammar, and it launched lines of inquiry

that shaped both the field of linguistics and the emerging field

of cognitive science for decades to come.

Chomsky and other researchers set out to investigate the two main components of universal grammar:

first, whether there are, in fact, grammar rules that are universal to all languages,

and, second, whether these rules are hardwired in the brain.

In attempts to establish the universal rules of grammar, Chomsky developed an analytical tool known as generative syntax, which represents the order of words in a sentence in hierarchical syntax trees that show what structures are possible.

Based on this tree, we could suggest a grammar rule that adverbs must occur in verb phrases.

But with more data, it quickly becomes clear that adverbs can appear outside of verb phrases.

This simplified example illustrates a major problem:

it takes a lot of data from each individual language to establish the rules for that language,

before we can even begin to determine which rules all languages might have in common.

When Chomsky proposed universal grammar, many languages lacked the volume of recorded samples necessary to analyze them using generative syntax.

Even with lots of data, mapping the structure of a language is incredibly complex.

After 50 years of analysis, we still haven’t completely figured out English.

As more linguist data was gathered and analyzed, it became clear that languages

around the world differ widely, challenging the theory that there were

universal grammar rules.

In the 1980s, Chomsky revised his theory in an attempt to accommodate this variation.

According to his new hypothesis of principles and parameters, all languages shared certain

grammatical principles, but could vary in their parameters, or the application of these principles.

For example, a principle is “every sentence must have a subject,"

but the parameter of whether the subject must be explicitly stated could vary between languages.

The hypothesis of principles and parameters still didn’t answer the question of which

grammatical principles are universal.

In the early 2000s, Chomsky suggested that there’s just one shared principle,

called recursion, which means structures can be nested inside each other.

Take this sentence, which embeds a sentence within a sentence within a sentence.

Or this sentence, which embeds a noun phrase in a noun phrase in a noun phrase.

Recursion was a good candidate for a universal grammar rule because it can take many forms.

However, in 2005 linguists published findings on an Amazonian language called Piraha,

which doesn’t appear to have any recursive structures.

So what about the other part of Chomsky’s theory, that our language faculty is innate?

When he first proposed universal grammar, the idea that there was a genetically

determined aspect of language acquisition had a profound, revolutionary impact.

It challenged the dominant paradigm, called behaviorism.

Behaviorists argued that all animal and human behaviors,

including language, were acquired from the outside

by the mind, which starts out as a blank slate.

Today, scientists agree that behaviorism was wrong,

and there is underlying, genetically encoded biological machinery for language learning.

Many think the same biology responsible for language is also responsible for other aspects of cognition.

So they disagree with Chomsky’s idea that there is a specific, isolated, innate language faculty in the brain.

The theory of universal grammar prompted the documentation and study of many languages

that hadn’t been studied before. It also caused an old idea to be reevaluated and eventually overthrown

to make room for our growing understanding of the human brain.