

NEWS IN FOCUS

PHYSICS Will a fog of data make the Higgs boson harder to see? **p.156**

PHYSICS Claim about quantum waves puts theorists in a spin **p.157**

BIOTECHNOLOGY First drug made in plant cells wins approval **p.160**



EPIDEMIOLOGY Bid to rescue archives of radiation data gathers steam **p.162**

MARTIN SCHOELLER/AUGUST



Culture shock: Pirahã speakers may be deviating from the largely accepted theory of language.

LINGUISTICS

War of words over tribal tongue

Debate highlights pitfalls in studying minority languages.

BY EUGENIE SAMUEL REICH

It wasn't long after his translation of the Gospel of St Mark failed to interest the Pirahã tribe members he was trying to convert to Christianity that Daniel Everett, then a missionary and linguistic anthropologist, began to doubt what he had learned about the foundations of human language.

Thirty years on, Everett, now at Bentley University in Waltham, Massachusetts, has long since left missionary work, but his study of the Pirahã tongue has increasingly cast him in the role of heretic in a battle over the

influence of culture in shaping the structure of a language. The debate has resurfaced with the publication in March of his book *Language: The Cultural Tool* and a related television documentary scheduled to be broadcast this week in the United States. But as Everett's controversial views gain attention, other scholars are beginning to question his interpretations.

When Everett began to learn Pirahã — today spoken by fewer than 400 people in the interior Brazilian state of Amazonas — he expected it to share certain grammatical features with other languages. These features, he says, would make Pirahã consistent with the concept of a

'universal grammar', which Noam Chomsky, a linguist at the Massachusetts Institute of Technology (MIT) in Cambridge, has famously theorized is hard-wired into the human brain. Over time, however, Everett concluded that Pirahã was missing some of those supposedly universal features, including the use of embedded clauses. In most languages, such clauses serve a wide range of functions, allowing speakers to discuss the thoughts of others, for example.

Everett also says that Pirahã speakers are reluctant to generalize beyond direct experience, or to talk about people they do not know, perhaps explaining their lack of interest in the biblical figures of his translation. He eventually concluded that these differences arose from the Pirahã having a culture that it based in the 'here and now', and he argues that this culturally determined grammar conflicts directly with Chomsky's theory of language.

Because Everett has spent far more time than anyone else living among the Pirahã and studying their language (some eight years, by his estimate), it has been difficult for other researchers to evaluate his claims, says Jan-Wouter Zwart, a linguist at the University of Groningen in the Netherlands. "All I know about Pirahã is from his grammar, and that's true for all of us. We are typically dependent on a single person's work."

Now, however, another researcher has collected independent data on Pirahã, and he says that his findings do not support Everett's interpretation. At a presentation in April at MIT, Uli Sauerland, a linguist at the Centre for General Linguistics in Berlin, told the audience: "My evidence is that they can express attitudes, and what I think they use to do this is embedded sentences." Sauerland is now preparing his data for publication.

In one experiment, Sauerland showed Pirahã speakers a skit in which one actor moved an object — such as a papaya or nut — from one hiding place to another, in front of a second, blindfolded actor. Sauerland says that the remarks of the subjects, when asked to describe the skit, could be best translated as: "Oope thinks the nut is under the banana leaf. It is really under the basket", or "Oope

doesn't know where the nut is", in which the parts of the sentence describing Oope's thoughts are embedded clauses. ▶

➔ **NATURE.COM**
To hear a native
Pirahã speaker, visit:
go.nature.com/7lrc9y

► Although Everett didn't see Sauerland's presentation, he suggests that the remarks could equally well be translated as two separate, direct sentences, such as: "The nut is under the banana leaf. Or so Oope says," or "Oope doesn't know. Where is the nut?"

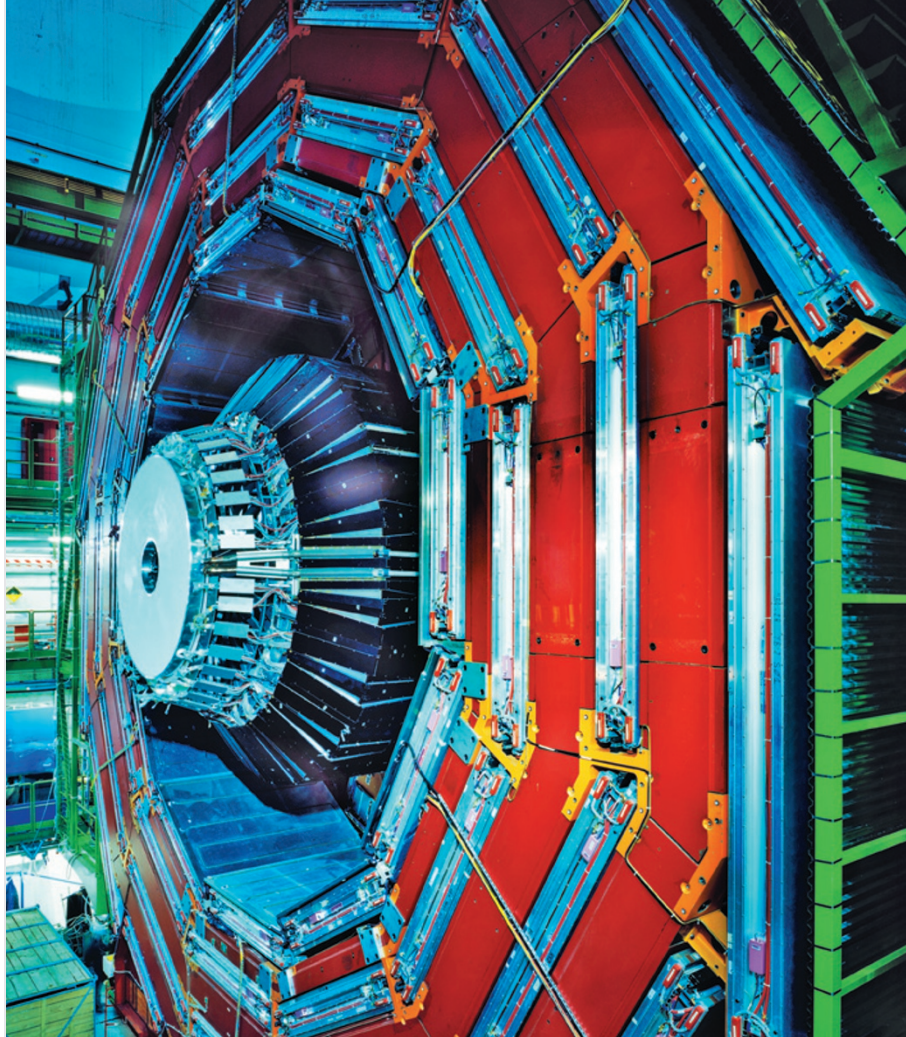
The difference is subtle, but it cuts to the heart of Everett's case against Chomsky's theory. Embedded clauses can be instances of recursion, an iterative process that Chomsky says is essential to all language because it enables ever more complex sentences to be built up out of individual words or sounds. Everett also says that Pirahã lacks colour and number terms and has no perfect tense, which is used in English for events that have been completed. Although many linguists say that Chomsky's theory of a universal grammar would hold even if Everett is right about those features, Everett believes that such a profound interplay between culture and language conflicts with Chomsky's theory of language as innate.

The situation underscores the potential difficulty in settling important claims about minority languages. The United Nations Educational, Scientific and Cultural Organization lists 2,473 languages as endangered, meaning either that they are spoken by only small communities of people or that the elderly people who speak them have not passed them on to subsequent generations. Many such languages have been studied by just a single linguist, so that other researchers must rely on that person's translations.

"For a lot of languages we have extremely poor documentation," says Lyle Campbell, a linguist at the University of Hawaii at Manoa who is leading ELCat, an online project supported by the US National Science Foundation that aims to catalogue endangered languages. Expected to launch later this month, ELCat will serve as a centralized repository for original data such as recordings, video, text, transcripts and translations. Campbell says that such documentation makes it possible for linguists to test each others' statements.

Thomas Roeper, a linguist at the University of Massachusetts in Amherst, says that linguists will inevitably have to work with data from a limited number of sources. "There are many languages that only one, two or three people have studied, with Western prejudices. It would be a great mistake if we didn't include their experiences in our knowledge," he says.

Everett and his colleagues are now testing his arguments using data on Pirahã collected by his missionary predecessor, Steve Sheldon. Everett is also working on making his own records available. "I have data recorded, and am translating more and more," he says. ■



The Compact Muon Solenoid experiment detects hundreds of millions of particle collisions every second.

PARTICLE PHYSICS

LHC prepares for data pile-up

Physicists scramble to see through fog of collisions.

BY GEOFF BRUMFIEL

The world's largest particle accelerator is roaring along at an unprecedented pace, delivering torrents of data to its physicist handlers. But the hundreds of millions of collisions happening inside the machine every second are now growing into a thick fog that, paradoxically, threatens to obscure a fabled quarry: the Higgs boson.

The problem is known as pile-up, and it promises to be one of the greatest challenges this year for scientists working on the Large Hadron Collider (LHC) at CERN, Europe's main high-energy physics laboratory near Geneva, Switzerland.

Huge amounts of computing power, cunning software and technical tricks are helping scientists to stay ahead of the problem.

But researchers may still need to scale back the collisions to find the long-sought Higgs, the manifestation of a field that is believed to confer mass on other particles.

If it exists, the Higgs will appear fleetingly inside the machine before decaying into lighter particles. Last year, the two biggest detectors at the LHC saw hints of a Higgs with a mass of about 125 gigaelectronvolts (energy and mass are interchangeable in particle physics). This year, researchers want to collect more data to see whether that signal grows into a certainty, or withers back to nothing.

Since it began its latest science run last month, the LHC has been squeezing trillions of protons into ever-smaller bunches, and smashing those bunches

ENRICO SACCHETTI

➔ **NATURE.COM**
To read more articles
on the LHC, see:
go.nature.com/uzvtfdd