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## ANGLAIS

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## Physicists Need to Be More Careful with How They Name Things

*The popular term “quantum supremacy,” which refers to quantum computers outperforming classical ones, is uncomfortably reminiscent of “white supremacy”*

Adapted from *Scientific American*, By Ian Durham, Daniel Garisto, Karoline Wiesner on February 20, 2021

In 2012, quantum physicist John Preskill wrote, “We hope to hasten the day when well controlled quantum systems can perform tasks surpassing what can be done in the classical world.” Less than a decade later, two quantum computing systems have met that mark: Google’s Sycamore, and the University of Science and Technology of China’s Jiūzhāng. Both solved  
5 narrowly designed problems that are, so far as we know, impossible for classical computers to solve quickly. How quickly? How “impossible”? To solve a problem that took Jiūzhāng 200 seconds, even the fastest supercomputers are estimated to take at least two billion years.

Describing what then may have seemed a far-off goal, Preskill gave it a name: “quantum supremacy.” In a blog post at the time, he explained “I’m not completely happy with this term,  
10 and would be glad if readers could suggest something better.”

We’re not happy with it either, and we believe that the physics community should be more careful with its language, for both social and scientific reasons. Even in the abstruse realms of matter and energy, language matters because physics is done by people.

The word supremacy—having “more power, authority or status than anyone else”—is closely  
15 linked to “white supremacy.” This isn’t supposition; it’s fact. The Corpus of Contemporary American English finds “white supremacy” is 15 times more frequent than the next most commonly used two-word phrase, “judicial supremacy.” Though English is the global lingua franca of science, it is notable that the USTC team avoided “quantum supremacy” because in Chinese, the character meaning “supremacy” also has uncomfortable, negative connotations.  
20 The problem is not confined merely to English.

White supremacist movements have grown around the globe in recent years, especially in the United States, partly as a racist backlash to the Black Lives Matter movement. As Preskill has recently acknowledged, the word unavoidably “evokes a repugnant political stance.”

“Quantum supremacy” has also become a buzzword in popular media [...]. Its suggestion of  
25 domination may have contributed to unjustified hype, such as the idea that quantum computers will soon make classical computers obsolete. Tamer alternatives such as “quantum advantage,” “quantum computational supremacy” and even “quantum ascendancy” have been proposed, but none have managed to supplant Preskill’s original term. More jargony proposals like “Noisy Intermediate Scale Quantum computing” (NISQ) and tongue-in-cheek suggestions like  
30 “quantum non-usefulness” have similarly failed to displace “supremacy.”

Here, we propose an alternative we believe succinctly captures the scientific implications with less hype and—crucially—no association with racism: quantum primacy.

What’s in a name? It’s not just that quantum supremacy by any other name would smell sweeter. By making the case for quantum primacy we hope to illustrate some of the social and scientific

35 issues at hand. In President Joe Biden’s letter to his science adviser, biologist Eric Lander, he asks “How can we ensure that Americans of all backgrounds are drawn into both the creation and the rewards of science and technology?” One small change can be in the language we use. [...] Were physics, computer science and engineering more diverse, perhaps we would not still be having this discussion, which one of us wrote about four years ago. But in the U.S., when  
40 only 2 percent of bachelor’s degrees in physics are awarded to Black students, when Latinos comprise less than 7 percent of engineers, and women account for a mere 12 percent of full professors in physics, this is a conversation that needs to happen. As things stand, “quantum supremacy” can come across as adding insult to injury.

The nature of quantum computing, and its broad interest to the public outside of industry  
45 laboratories and academia means that the debate around “quantum supremacy” was inevitably going to be included in the broader culture war.

In 2019, a short correspondence to *Nature* argued that the quantum computing community should adopt different terminology to avoid “overtones of violence, neocolonialism and racism.” Within days, the dispute was picked up by the conservative editorial pages of the *Wall*  
50 *Street Journal*, which attacked “quantum wokeness” and suggested that changing the term would be a slippery slope all the way down to cancelling Diana Ross’ “The Supremes.”

Linguist Steven Pinker weighed in to argue that “the prissy banning of words by academics should be resisted. It dumbs down understanding of language: word meanings are conventions, not spells with magical powers, and all words have multiple senses, which are distinguished in  
55 context. Also, it makes academia a laughingstock, tars the innocent, and does nothing to combat actual racism & sexism.”

It is true that “supremacy” is not a magic word, that its meaning comes from convention, not conjurers. But the context of “quantum supremacy,” which Pinker neglects, is that of a  
60 historically white, male-dominated discipline. Acknowledging this by seeking better language is a basic effort to be polite, not prissy.

Perhaps the most compelling argument raised in *favor* of “quantum supremacy” is that it could function to reclaim the word. Were “quantum supremacy” 15 times more common than “white  
65 supremacy,” the shoe would be on the other foot. Arguments for reclamation, however, must account for *who* is doing the reclaiming. If the charge to take back “quantum supremacy” were led by Black scientists and other underrepresented minorities in physics, that would be one thing. No survey exists, but anecdotal evidence suggests this is decidedly not the case.

To replace “supremacy,” we need to have a thoughtful conversation. Not any alternative will do, and there is genuinely tricky science at stake. Consider the implications of “quantum  
70 advantage.” An advantage might be a stepladder that makes it easier to reach a high shelf, or a small head start in a race. Some quantum algorithms are like this. Grover’s search algorithm is only quadratically faster than its classical counterpart, so a quantum computer running Grover’s algorithm might solve a problem that took classical computers 100 minutes in the square root of that time—10 minutes. Not bad! That’s definitely an advantage, especially as runtimes get longer, but it doesn’t compare to some quantum speedups.

75 Perhaps the most famous quantum speedup comes from Shor’s algorithm, which can find the factors of numbers (e.g. 5 and 3 are factors of 15) almost exponentially faster than the best

classical algorithms. While classical computers are fine with small numbers, every digit takes a toll. For example, a classical computer might factor a 100-digit number in seconds, but a 1000-digit number would take billions of years. A quantum computer running Shor's algorithm could do it in an hour.

When quantum computers can effectively do things that are impossible for classical computers, they have something much more than an advantage. We believe primacy captures much of this meaning. Primacy means “preeminent position” or “the condition of being first.” Additionally, it shares a Latin root (*primus*, or “first”) with mathematical terms such as prime and primality.

While quantum computers may be first to solve a specific problem, that does not imply they will dominate; we hope quantum primacy helps avoid the insinuation that classical computers will be obsolete. This is especially important because quantum primacy is a moving target. Classical computers and classical algorithms can and do improve, so quantum computers will have to get bigger and better to stay ahead.

These kinds of linguistic hotfixes do not reach even a bare minimum for diversifying science; the most important work involves hiring and retention and actual material changes to the scientific community to make it less white and male. But if opposition to improving the language of science is any indication about broader obstacles to diversifying it, this is a conversation we must have.

Physicists may prefer vacuums for calculation, but science does not occur in one. It is situated in the broader social and political landscape, one which both shapes and is shaped by the decisions of researchers. (1303 words)

*This is an opinion and analysis article.*

## 1. READING COMPREHENSION

Answer the following questions *in your own words*.

- Any passage including 3 or more words in sequence taken from the source, or paraphrase without citation will be penalized.

- 50 words minimum / question.

1. Explain the following sentence: “*Perhaps the most compelling argument raised in favour of “quantum supremacy” is that it could function to reclaim the word.*”

2. What are the arguments in favour of the phrase “*quantum primacy*”?

3. Why is the author particularly critical of the phrase “*quantum supremacy*” in the field of physics?

4. Explain the following sentence and give precise examples: “*English is the global lingua franca of science*”.

## 2. ESSAY

**Discuss the statement below (450 words, +/- 10%; use a / every 50 words). Please indicate the number of words at the end of your essay.**

*Linguist Steven Pinker weighed in to argue that “the prissy banning of words by academics should be resisted. It dumbs down understanding of language: word meanings are conventions, not spells with magical powers, and all words have multiple senses, which are distinguished in context. Also, it makes academia a laughingstock, tars the innocent, and does nothing to combat actual racism & sexism.” (1.52-56)*