

Metric prefixes sought for extreme numbers

“Ronna” and “quecca” would help computer scientists keep pace with big data

By David Adam

Fresh from redefining the kilogram and other fundamental measures, the guardians of the metric system have set their sights on another upgrade: new prefixes for outrageously large and small numbers.

A proposal lodged with the International Bureau of Weights and Measures (BIPM) in Paris recommends new names—ronna and quecca—as prefixes for 10^{27} and 10^{30} , respectively. They would be joined by their microscopic counterparts, ronto for 10^{-27} , and quecto for 10^{-30} . If approved, the new terms could be formally introduced in 2022. They would be the first prefixes added since 1991.

The planned update responds to the massive growth in global data storage, which by the early 2030s is forecast to reach 1 yottabyte (10^{24})—the top of the existing scale. Without new prefixes, computer scientists will have no way to officially talk about what comes next. At the other end of the scale, quantum physicists have measured atomic forces as small as 42 yoctonewtons. Much smaller and they run out of metrological road.

“Where there is a need that is not met, there is also a risk that unofficial units can take hold and that can cause confusion,” says Richard Brown, head of metrology at the National Physical Laboratory near London, who came up with the new names. He says unofficial terms beyond yotta, including brontobyte and geobyte, are already becoming popular. Although mathematicians sometimes use the prefix googol (10^{100}), a name coined a century ago by a 9-year-old girl, it, too, is unofficial.

Brown prefers to follow tradition. The new prefixes should relate etymologically to nine and 10, to represent the ninth and 10th powers of 10^3 . He also wanted to continue the reverse alphabetical trend set by zetta

and yotta, but needed to avoid letters such as X, W, and V that could be confused with other terms. And so, drawing from the Latin and Greek words for nine (*novem, ennea*) and 10 (*decem, deka*), with some poetic license to make the terms more easily pronounced, he came up with ronna, quecca, ronto, and quecto. “It’s supposed to be a conversation starter,” says Brown, who published his proposal last month in the journal *Measurement*.

The terms are due to be discussed at the October meeting of BIPM’s Consultative Committee for Units. If the committee approves the idea, it could make a formal recommendation to BIPM. The organization’s general conference, which includes government representatives and is due to next meet in 2022, would have the final vote—as

it did late last year when it approved a new definition of the kilogram based on fundamental physical constants (*Science*, 9 November 2018, p. 625).

It’s too early to say whether the prefixes will be adopted, says Estefanía de Mirandés, executive secretary of the units committee and a physicist with BIPM. “It would be premature to mention a possible outcome of the discussion,” she wrote in an email.

Other proposals to extend the measurement scale have fizzled. In 2010, a physics student in California suggested “hella” as a prefix for 10^{27} , and thousands of people signed an online petition in support. (Contrary to reports, the idea did not reach the BIPM units committee for formal discussion.) In 2008, an article in *The New York Times* on super-

computers referred to a xeraflop, and a 2015 paper on cosmic engineering used the symbols X, W, and V to describe the gargantuan energy levels, beyond the yotta scale, that could be seen if aliens turned a black hole into a particle accelerator. One prankster hacked a Wikipedia article in 2008 to introduce a new technical term for a computer that could attempt 10^{48} operations per second: a gonnaflop. It lasted 7 minutes before being deleted.

Ronna, quecca, and their partners could fare better. Emilio Prieto, who represents the Spanish Metrology Center in Madrid on the units committee, says he would vote for the names because they are simple and memorable. “Once people start using the wrong prefix names it is impossible to go back,” he says.

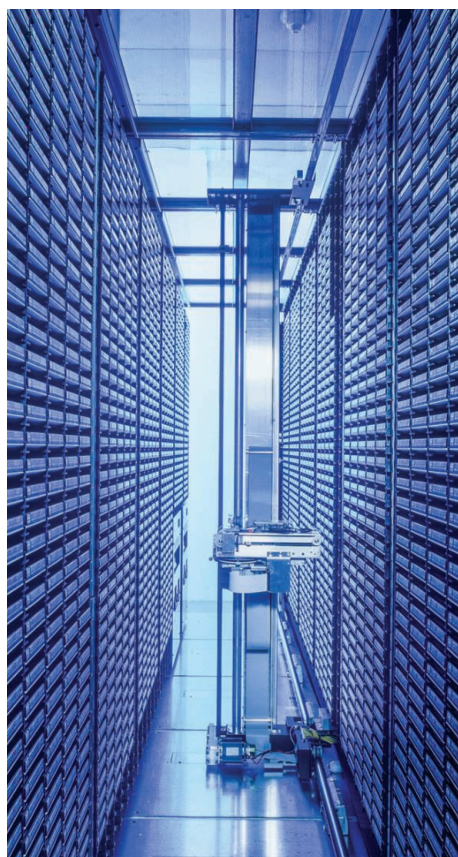
If those four are approved, Brown says, only a single good letter would remain that could be used on its own for 10^{33} and 10^{-33} in future: B (and b). Brown already has names at the ready: bundecca and bundecto, based on the Latin for 11, *undecim*. ■

David Adam is a journalist based near London.

A whole lotta yottas

Metrologists are proposing to extend metric prefixes beyond yotta and yocto. By the 2030s, computer data storage (pictured) may surpass 1 yottabyte. Scientists need numbers to describe this new regime.

PREFIX	SYMBOL	POWER
quecca	Q	10^{30}
ronna	R	10^{27}
yotta	Y	10^{24}
zetta	Z	10^{21}
exa	E	10^{18}
peta	P	10^{15}
tera	T	10^{12}
giga	G	10^9
mega	M	10^6
kilo	k	10^3
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}
femto	f	10^{-15}
atto	a	10^{-18}
zepto	z	10^{-21}
yocto	y	10^{-24}
ronto	r	10^{-27}
quecto	q	10^{-30}



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